ENERGY FACILITY SITING ISSUES IN NEW JERSEY'S COASTAL ZONE

A Staff Working Paper

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ABSTRACT

The requirement of the New Jersey Coastal Area Facility Review Act and the Federal Coastal Zone Management Act that energy facility siting be included in any coastal planning has mandated that the New Jersey Office of Coastal Zone Management (NJOCZM) address the siting of energy facilities in the coastal zone.

This report frames the issues facing coastal energy planners. Issues addressed include nuclear power, Outer Continental Shelf oil and gas exploration and development, deepwater ports, liquefied natural gas, and the more general issues of energy conservation and the siting of energy facilities. The report includes an overview of how energy is used and produced today in New Jersey.

The report sets forth some principles which will guide the NJOCZM in developing energy facility siting policies within the coastal zone.

The report is intended as a working document to provoke discussion by energy users and energy producers, by local, state, and federal officials and agencies, by private interests and by the public. Hopefully, these discussions will lead to a further refinement of the issues, from which responsible and coherent coastal energy facility siting policies will emerge which can be incorporated into New Jersey's coastal management strategy.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

Energy production and environmental protection are viewed by some as incompatible goals because energy has become associated with growth while the latter symbolizes "no growth", at least to some. The conflict is particularly acute in New Jersey where competition between land uses is intense and where energy plays such an important role in the state's economy, with the state's largest industry, the petroleum and petrochemical industry, based on energy. Existing energy facilities, located close to New Jersey's two ports -- the district of the Port Authority of New York and New Jersey in the northeast and the Port of Camden on the Delaware River in the west -- have contributed to the industrialization and growth of the state's economy. Some types of energy facilities have been proposed and even constructed by electric and gas utilities along the state's recreational shoreline, outside of these traditional locations. This shoreline may also have to accommodate land-based facilities resulting from the U.S. Department of the Interior's oil and gas development program off the shores of New Jersey. While the State has played some role in energy planning to date, the recent natural gas crisis indicates that the State should assume a more active role as far as securing an adequate supply of energy for its residents and businesses and ensuring that appropriate sites be set aside for this purpose.

The New Jersey Coastal Area Facility Review Act (CAFRA) of 1973 and the federal Coastal Zone Management Act of 1972 (and its 1976 Amendments) require that energy facility siting be addressed in the development of a comprehensive coastal management program. The federal act goes further than CAFRA in seeing a national interest associated with some energy facilities and requiring that this national interest be addressed in the state's program. This paper attempts to address some of these issues. NJOCZM recognizes, of course, that the provision of energy resources involve numerous interests at the local; state, federal, public and private levels, and that any energy plan must be drafted in concert with these various interests. This paper should be regarded, therefore, as providing a preliminary perspective on the energy issues facing the state's, coastal zone. The policy recommendations submitted provide the beginning for a coherent strategy to guide NJOCZM's mandated role regarding energy facilities.

Section II outlines the role of energy in the economy and environment of New Jersey.

Section III describes some conservation measures which could reduce energy demand. It also suggests alternative energy sources for the future.

Section IV outlines the key issues concerning the siting of nuclear and conventional electric generating plants, liquified natural gas facilities, deepwater ports, and facilities related to the exploration, development, and production of oil and gas, especially from the Outer Continental Shelf (OCS).

Section V outlines state and federal involvement in energy facility siting in New Jersey's coastal zone.

Section VI indicates the location of existing energy facilities for the six regions of the coast, and provides an initial appraisal of the ability of these regions to absorb additional energy facility development.

Section VII presents draft energy policy recommendations which NJOCZM will be considering in developing energy facility siting guidelines for the coastal zone.

Section VIII concludes this discussion paper with a brief summary and conclusion.

II. THE ROLE OF ENERGY IN NEW JERSEY'S ECONOMY

This section describes the role of energy in New Jersey's economy for the purpose of placing the later discussion on proposed energy facilities into clearer perspective.

A. Background

Even though New Jersey does not produce any fuel of its own (aside from an insignificant portion of hydroelectric power at Jersey Central Power and Light's Yard Creek pumped storage plant D), its largest industry, the petroleum and petrochemical industry, is based on petroleum and natural gas by-products or feedstocks. The size of this industry is due in part to New Jersey's location and particularly to its ports on the Hudson and the Delaware Rivers which were catalysts for industrialization.

New Jersey's economy is mostly fueled by imported oil and domestic natural gas. Until the early 1970's, the State's favorable seaboard location provided a cost advantage over other parts of the country which had to pay considerably more per barrel for domestic fuel oil and higher transportation costs for importing fuel.[1] It is not surprising, therefore, that New Jersey was severely affected by the 1973/74 oil embargo by the Organization of Petroleum Exporting Countries (OPEC) and its aftermath, which resulted in prices rising from $5.25 per barrel in 1973 to between $12 and $16 per barrel in 1976, depending on the country from which petroleum was imported.[2] Given New Jersey's reliance on imported petroleum and the uncertain policies of the OPEC countries, New Jersey is, to say the least, in a precarious position with respect to its oil supply. This is one reason, it has been claimed, that New Jersey should not oppose or delay the development of Outer Continental Shelf oil and/or gas off its coast, which might increase its supply of energy and lessen its dependence on domestic or foreign sources. While this claim may not turn out to be correct, in fact, New Jersey's policy has been to encourage the rapid exploration of the Outer Continental Shelf off its coast provided this be accomplished in a manner which is compatible with maintaining coastal environment and tourism economy.

B. Consumption

Table I shows that in 1974 New Jersey consumed 75 percent of its energy in the form of petroleum, and 19 percent in the form of natural gas, with the remainder split between coal and nuclear fuel. New Jersey's petroleum consumption is almost double that of the proportion of the nation, whose share is about 45 percent. By contrast, on a proportional basis, the state uses about one third less natural gas than the nation. This gas is, however, important especially for those industries who cannot easily use alternative fuel types in their processing operations such as the glass industry. Petroleum and natural gas more than offset the state's consumption of coal, which is one sixth of the per state national average of 18 percent. (See Table 1). While nuclear fuel constituted two percent of the state's overall consumption in 1974, it contributes over twenty percent to New Jersey's electric power generation. This is about double the national average for nuclear powered electricity.

Fuel is used mainly for space heating and lighting in the residential and commercial sectors. Four industries--chemical, petroleum, food and paper--are the major consumers of fuel in the industrial sector. The transportation sector runs entirely on petroleum. As Table 1 indicates, just over one third of New Jersey's petroleum was consumed by the transportation sector.

Table I
United States and New Jersey Gross Energy Consumption[1]
1974

(trillion Btu's)

Energy Source	New Jersey		United States	
Petroleum	1274.2	75.3%	33,414	45.9%
Coal	86.2	5.1%	13,241	18.1%
Natural Gas (including natural gas liquids)	292.9	17.3%	21,733	29.8%
Nuclear	38.6	2.2%	3,290	1.6%
Total	1,691.9	100.0%	72,880	100.0%

[1]Gross energy consumption refers to all types of energy at the time it is incorporated into the economy, comprising inputs of primary fuels or their derivatives, and output of hydropower and nuclear power converted to theoretical fuel inputs. Gross energy includes energy used for producing, processing and transportation.

SOURCE: New Jersey: Federal Energy Administration Annual State Energy Consumption, September 30, 1975.

United States: U.S. Department of the Interior, Bureau of Mines, News Release, April 5, 1976 (1974 is the latest year for which state statistics are available).

The proportions of fuel used in New Jersey in the residential, industrial, commercial, transportation and utility sectors are shown in Table 2.

Table 2

New Jersey Consumption of Energy by Sector
1974
Trillion BTU's

	BTU's	1974[1] Percent
Residential	394.9	21.0
Industrial	250.7	14.0
Commercial	287.9	16.0
Transportation	520.1	28.0
Utility	381.9	21.0
Agriculture	3.4	--
	1838.9	100%

[1]Federal Energy Administration, "Gross Energy Consumption, State of New Jersey", September 30, 1975 (Computer Printout).

[2]Industry includes agriculture which constitutes less than one percent of energy consumption.

Note that one fifth of all energy is consumed by the utility sector.

C. Cost of Fuel

New Jersey enjoyed a fuel cost advantage for many years, but it has now been placed at a disadvantage due to the steep rise in prices dating back to the early 1970's, including the decisions of the OPEC countries to increase their prices. This has placed New Jersey's industries at a competitive disadvantage with respect to much of the rest of the nation. Table 3 indicates that the Mid-Atlantic region, of which New Jersey is a part, pays 32 percent more for electric energy, 41 percent more for natural gas, 16 percent more for petroleum, and 13 percent more for coal than the national average. The price structure for these three consuming sectors is not, however, uniform. The residential sector, for example, paid 943.7 cents per million British Thermal Units (c/mmBTU) in 1973 which is double the 445.5 (c/mmBTU) that industry paid. Nevertheless, industry in the Mid-Atlantic paid about 25 percent more for its fuel than the national average in 1973. The relatively low price of natural gas explains why the utilities switched to this fuel, and why they have been so severely affected by curtailments of interstate gas supplies. Coal, which cost less in 1973 than any of the other fuels, is strictly regulated by both the state and federal government because of the difficulties in mining it and the emissions associated with burning coal. Renewed attention is, however, being given to coal because of high costs and other factors associated with alternative oil, gas and nuclear fuels.

Table 3

Cost of Energy in 1973
U.S. versus Middle Atlantic States

(Cents Per Million British Thermal Units)

	Electric Energy	Natural Gas	#2 Oil[1]	#6 Oil[2]	Coal
United States					
Residential	697.5	125.1	161.6	--	--
Commercial	674.1	95.2	142.8	--	--
Industrial	342.9	50.1	99.2	74.2	46.2
Electric Utility Plants	--	35.2	78.3[3]	85.3	41.9
Average Price	571.5	76.4	33.0	26.1	20.95
Middle Atlantic					
Residential	943.7	160.3	N/A	--	--
Commercial	899.8	127.3	94.4	--	--
Industrial	445.5	82.5	87.7	71.4	51.4
Electric Utility Plants[4]	--	63.4	82.8[3]	66.7	47.5
Average Price	763.	108.3	43.85	27.6	23.75
Middle Atlantic Price as a Percentage of U.S. Price	34%	+41%	+32%	+0.5%	+13.3%

Source: -Gas Facts American Gas Association, 1973
-Mineral Yearbook, U. S. Bureau of Mines 1973
-Edison Electric Institute Statistical Yearbook 1973
-Petroleum Facts, American Petroleum Institute

[1]#2 Oil is distillate fuel oil used for heating in the residential and commercial sector.

[2]#6 Oil is residual oil (heavy fuel oil) used to generate electricity.

[3]These figures include some of #2 oil.

[4]The Middle Atlantic region, as defined by the Edison Electric Institute, includes New York, Pennsylvania and New Jersey.

While the price of petroleum is regulated by the Federal Energy Administration, New Jersey consumers would possibly benefit from lowered transportation costs from oil and gas coming from the Baltimore Canyon.

D. Availability of Fuel

1. Petroleum

New Jersey is a major refining center on the Atlantic Coast with a refining capacity of 715,000 barrels of oil per day. Its five operating refineries, and the Hess refinery which was closed in 1974 but which could become functional again, if needed, are shown on Table 4 and Figure 1. All could probably be substantially expanded in capacity at the existing site.

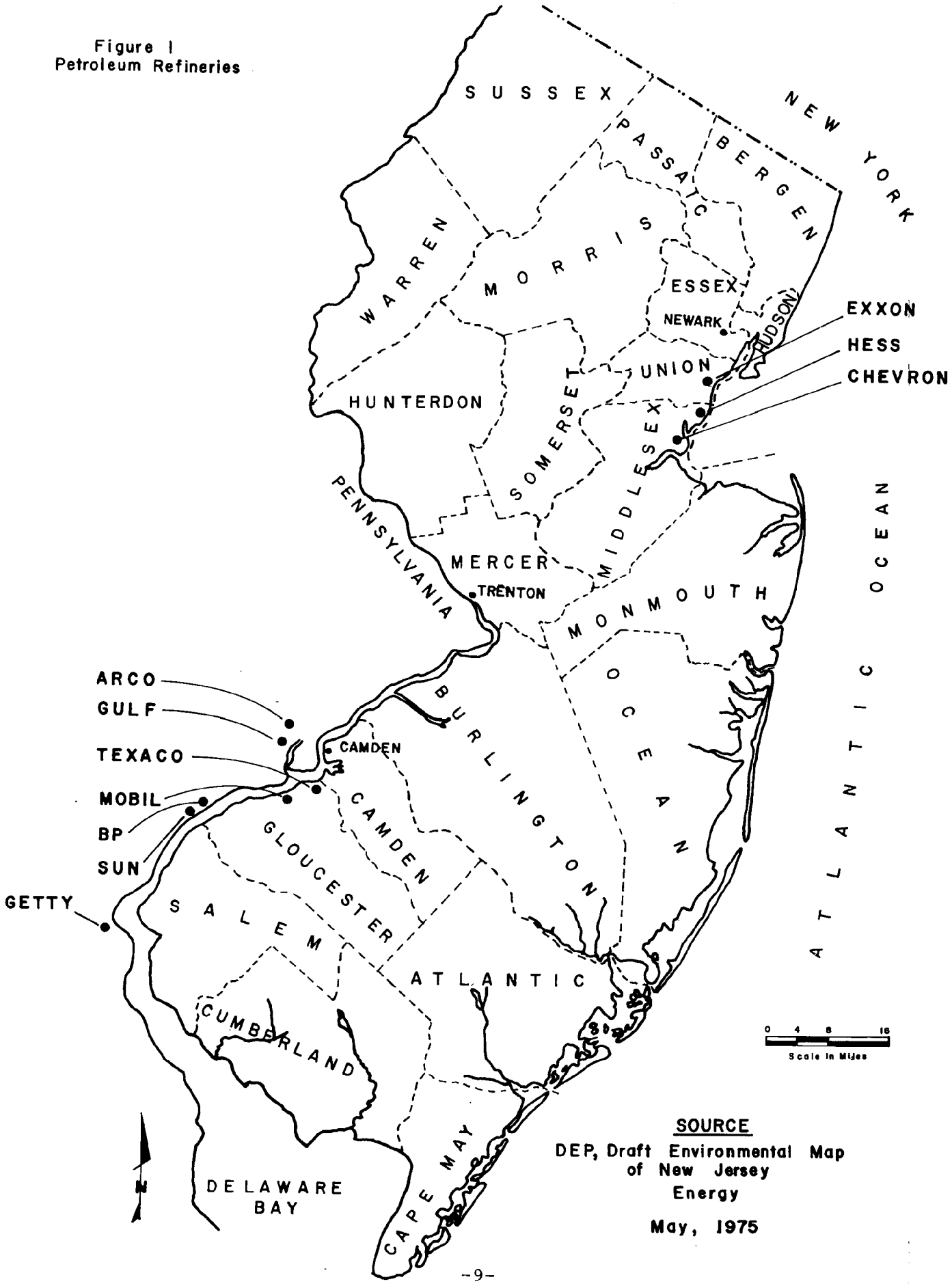
New Jersey is expected, within the next ten years, depending on the rate of exploration and development, to be the principal refiner of whatever petroleum is discovered off the New Jersey and the New England coast.[3]

Apart from refineries in northern New York (Buffalo) and New Hampshire and one that is shut down in Rhode Island, there are no refineries on the east coast north of the Jersey refineries. Petroleum found offshore and not refined in New Jersey would probably be refined in the adjacent Pennsylvania or Delaware refineries fronting on the Delaware River. It should be noted that most of the companies which obtained leases from the Department of the Interior sale in August 1976 have refineries in either Pennsylvania, New Jersey or Delaware, except for Shell Oil Company.

While existing refinery capacity in the region will probably be adequate to handle any petroleum found in the first OCS lease sale, additional lease sales could generate the need for more refining capacity and facilities, at existing or new sites.

Conversations with oil industry representatives indicate that because of the high investments associated with building new refineries, that they expect to expand rather than build new refineries.

Figure 1
Petroleum Refineries



SOURCE

DEP, Draft Environmental Map of New Jersey
Energy

May, 1975

Table 4

Oil Refineries in New Jersey,
Pennsylvania and Delaware

Refinery	Location	Capacity (barrels/calendar day)
New Jersey		
Amerada-Hess	Port Reading	70,000[1]
Chevron	Perth Amboy	168,000
Exxon	Linden	285,000
Mobil	Paulsboro	98,000
National Oil Recovery	Bayonne	6,000[2]
Texaco	Westville	88,000
		715,000
Pennsylvania		
Atlantic Richfield	Philadelphia, Pa.	185,000
British Petroleum	Marcus Hook, Pa.	161,000
Gulf	Philadelphia, Pa.	204,000
Sun	Marcus Hook, Pa.	165,000
		715,200
Delaware		
Getty	Delaware City, Del.	140,000
Total Mid-Atlantic Refinery Capacity		1,570,200
New Jersey Share of Mid-Atlantic, not including shut down Hess refinery[1]		41%

[1] Inoperative since early November, 1974.
[2] This plant was shut down in July 1977. When operational it refines both contaminated crankcase oil and #2, #4 and #6 oil.

Source: Oil and Gas Journal, March 28, 1977.
DEP, Draft Environmental Map of New Jersey - Energy, May, 1975.
Federal Energy Administration, Strategic Petroleum Reserve Office, Draft Environmental Impact Statement, Strategic Petroleum Reserves, June 1976, p. IV-151, Table IV-42.

New Jersey's six refineries have the processing capacity of 715,000 barrels per calendar day (365 days).

The National Oil Recovery refinery is located in Hudson County and the Exxon and Chevron refineries are located in Union and Middlesex Counties on the Arthur Kill. The Texaco and Mobil refineries are located south of Camden in Gloucester County (See Figure 1 and Table 3). The Amerada-Hess facility, also on the Arthur Kill, has been closed since 1974. The refinery could become operative again if the capacity were needed, which is possible since Hess was one of the companies which obtained shares in eight tracts it bid on with Mobil Oil in the Baltimore Canyon.[4]

2. Natural Gas

Natural gas is a fuel which became popular in New Jersey because of its low cost, and clean handling and burning characteristics. In 1972, it constituted 28.4 percent of the energy consumed in New Jersey. Its share of the fuel market dropped to 19.0 in 1974.[5] This was due in part to curtailments in interstate shipments of natural gas from the Gulf Coast. It is too early to say whether an increase in the price of interstate gas by the Federal Power Commission in the summer of 1976 will result in an increase in the supply.

Gas is supplied to New Jersey's four gas utilities, Public Service Electric and Gas (PSE&G), South Jersey Gas Company, New Jersey Natural Gas Company and Elizabethtown Gas Company. These purchased natural gas from six pipeline companies, the largest of which is Transcontinental Pipeline Company (Transco) (See Figure 2 for map of gas pipelines.)

Gas is used in about equal proportions by the residential and commercial sectors. It is in the industrial sector, however, in which its use is crucial, especially in the stone, clay, glass, chemical and primary metal industry, where the precise temperature controls and flame characteristics ensured by gas burning are important to avoid contamination.[6]

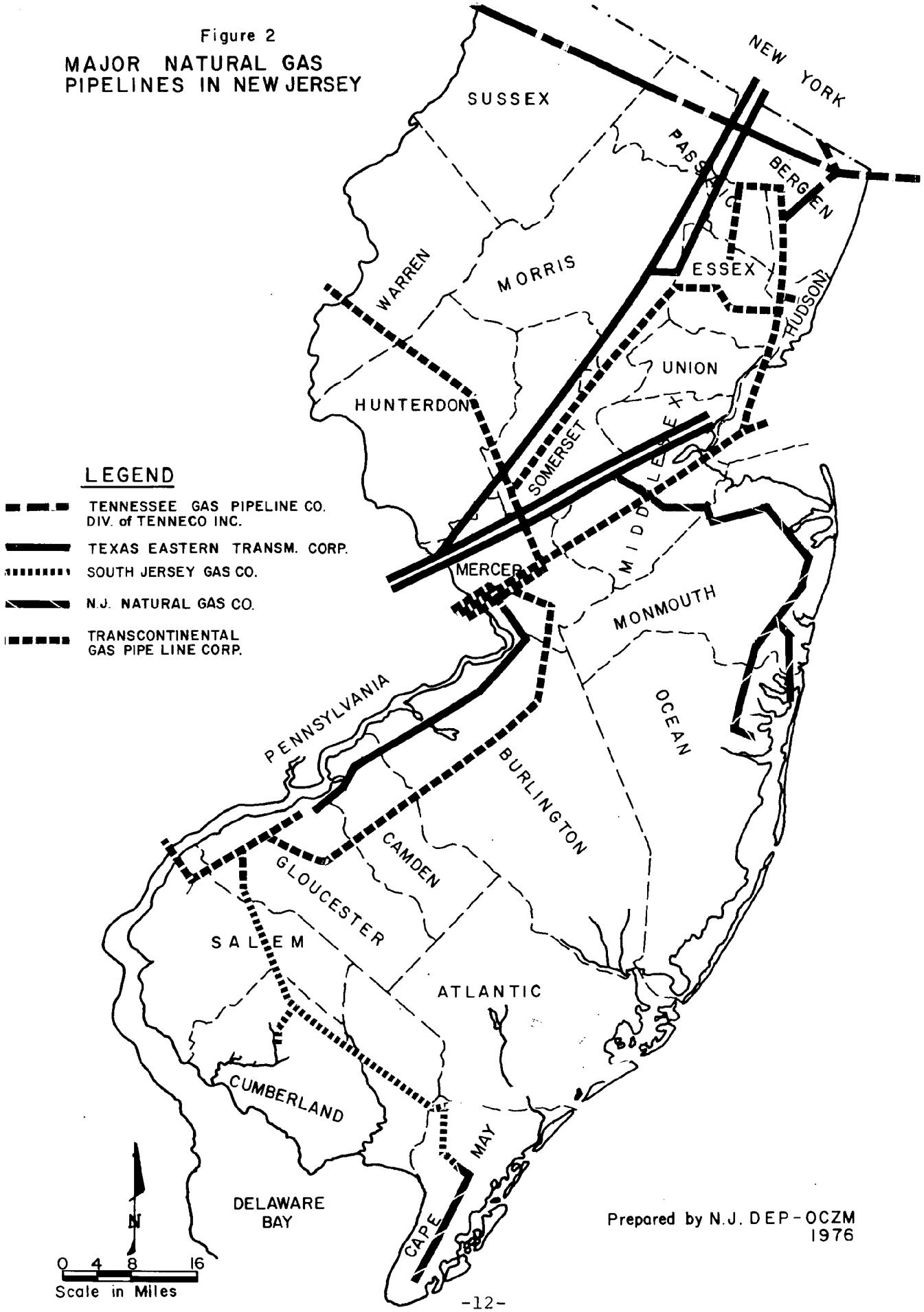
In a study of large users of gas in 1975 by the New Jersey Department of Labor and Industry, 32.6% of industrial users sampled knew of no feasible alternative or substitute for natural gas.

To fill the gap left by curtailments, Public Service Electric and Gas Company and Transco have sought overseas sources of the gas which would have to be imported in liquefied form in special tankers. A contract was signed with Sonatrech in Algeria in 1975 to import the gas, although PSE&G has not yet obtained the necessary import license from the Federal Power Commission.[8]

In May 1976, the U.S. Department of the Interior estimated that between 2.6 and 9.4 trillion cubic feet of gas would be found over a 25 year period in the Lease Sale 40 area offshore.[9] This breaks down to 104 billion cubic feet per year or one third of New Jersey's consumption of gas in 1973 in the low case and 300 billion cubic feet in the high case. Three hundred billion

Figure 2

MAJOR NATURAL GAS PIPELINES IN NEW JERSEY



Prepared by N.J. DEP - OCZM
1976

cubic feet is the amount of gas New Jersey consumed in 1973. Gas found in the Baltimore Canyon would lessen the pressure to import this gas, whose shipment, unloading and transfer pose siting and public safety problems.

Conservation could reduce the demand for natural gas to some extent. Natural gas is not, however, a fuel which can be easily replaced by other forms, specially since its non-polluting characteristics make it attractive in existing industrial areas which have to meet Federal and State air quality standards. It is also desirable in undeveloped areas where it will not contribute to degradation of existing air quality.

3. Electricity

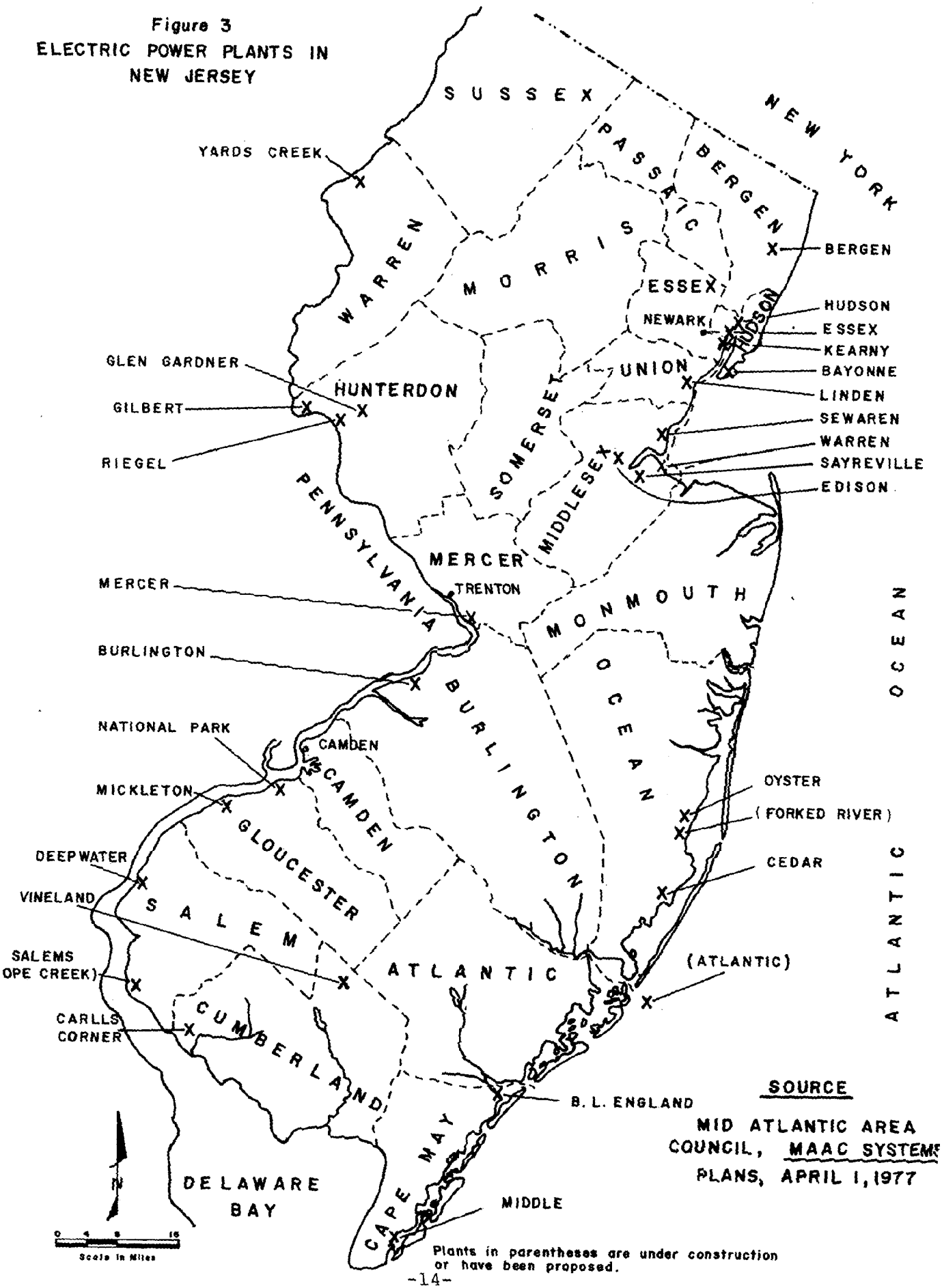
Electricity is a secondary form of energy generated by steam, which in turn can be produced by using petroleum, gas, uranium or coal to heat water. In New Jersey the major share of electric power is generated by petroleum and nuclear energy. New Jersey's 27 electric generating plants are shown in Figure 3 and listed on Table 6. Figure 4 indicates major electric transmissions lines.

Electricity is provided by five utilities: Public Service Electric and Gas Company, Atlantic City Electric Company, Jersey Central Power and Light Company, Rockland Electric Company, and the municipally-owned City of Vineland Electric Utility. With the exception of Rockland Electric, these are members of the Pennsylvania-New Jersey-Maryland Interconnection (PJM), an integrated power pool with a combined generating capacity of 1.5 million kilowatts. The purpose of the pool is to create a reserve of power for unusual demand conditions such as the breakdown of equipment. The interchange of power provides flexibility in meeting demand and lower costs to consumers. PJM is also a member of the Mid-Atlantic Area Coordination Agreement, (MAAC) a compact designated to improve service reliability through coordinated planning for new facilities and coordination with adjacent utility groups.

While electricity at the point of consumption is clean and pollution free, its production is fraught with pollution producing impacts. The burning of coal, for example, has been discouraged by strict state and federal statutes regulating air emissions. In response, utilities have turned to oil, gas and nuclear energy to fuel their electric generating plants.

New Jersey's twenty-seven power plants are shown in Table 5. Of these, two are nuclear-fueled, four have gas units, three use coal and the remainder rely on oil. One pumped storage facility exists near Blairstown at Yards Creek off the upper Delaware River.

Figure 3
ELECTRIC POWER PLANTS IN
NEW JERSEY



SOURCE

MID ATLANTIC AREA
COUNCIL, MAAC SYSTEMS
PLANS, APRIL 1, 1977

Plants in parentheses are under construction or have been proposed.

Figure 4

MAJOR ELECTRIC TRANMISSION LINES IN NEW JERSEY

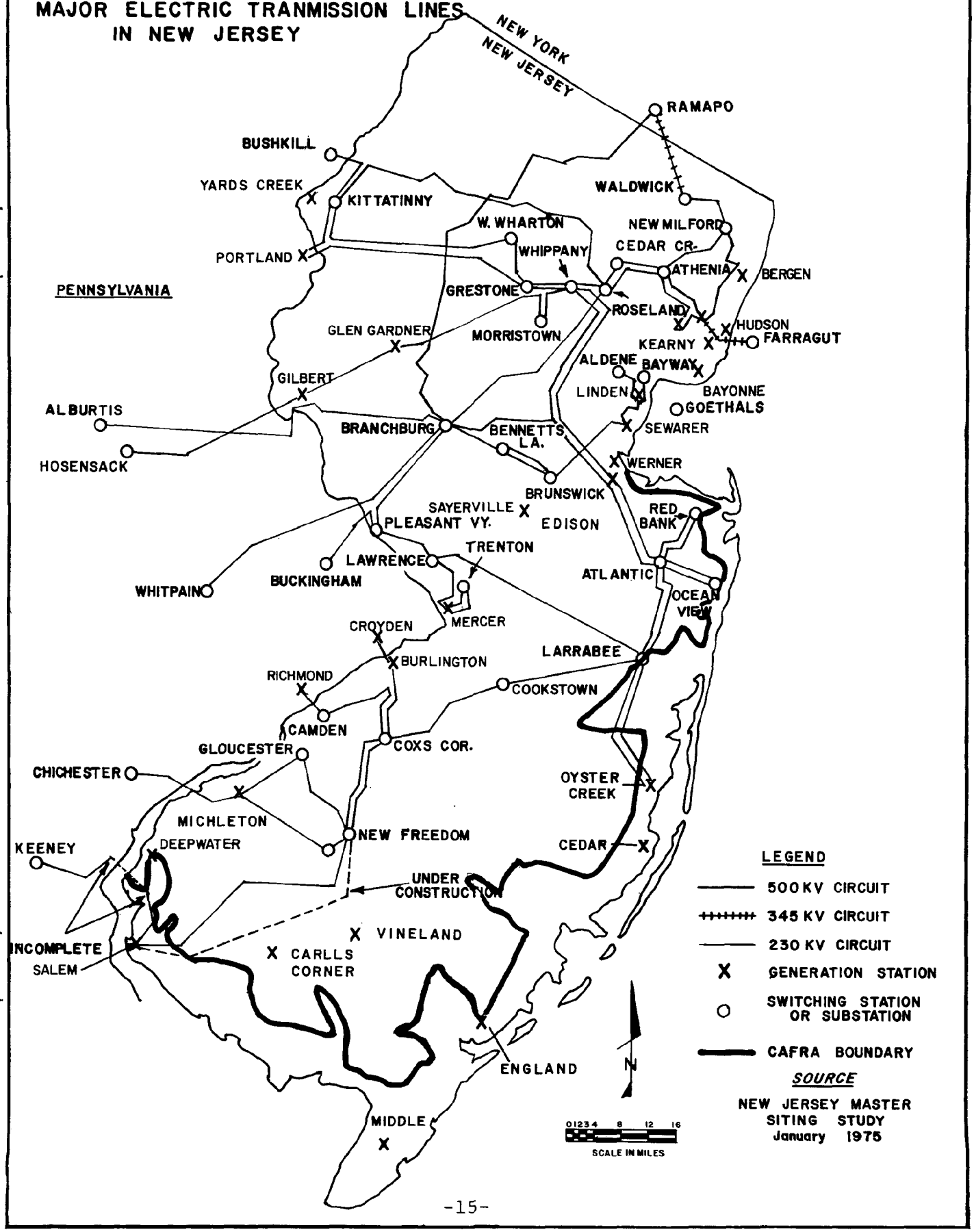


Table 5

Power Stations in New Jersey, 1976
Source & Key to Abbreviations

A. Key to Abbreviations

COMPANY

ACE	Atlantic City Electric Group
JCPL	Jersey Central Power & Light (a subsidiary of General Public Utilities Service Corporation)
PSEG	Public Service Electric & Gas
Vineland	The City of Vineland Electric Utility
J	Joint Ownership (see footnotes)

TYPE

CC	Combined Cycle (Combustion Turbine and Steam Turbine)
CT	Combustion Turbine
F	Fossil-fueled Steam
N	Nuclear-fueled Steam
D	Diesel
PH	Pumped Hydro

PRIMARY FUEL

O	Oil
C	Coal
G	Gas
N	Nuclear

COOLING

OT	Once Through
CL	Cooling Tower, Closed Loop
SP	Spray Pond

B. Source of Information

MAAC Systems Plan, Mid-Atlantic Area Council, April 1, 1976: Draft Environmental Map of New Jersey-Energy, DEP, May 1975; Electricity Generation and Oil Refining, MESA New York Bight Atlas, Monograph 25, July, 1975; Public Service Electric and Gas, Atlantic City Electric Company, Jersey Central Power and Light, the City of Vineland Electric Utility.

C. Footnotes to Table 5 appear on page 46.

Power Stations in New Jersey, 1976[1]

Station	Unit No.	Company	Type	Normal New MW Capacity		Primary Fuel	Cooling	Location	
				Summer	Winter			Municipality	County
Bayonne	1,2[2]	PSEG	CT	30	48	O	AIR	Bayonne	Hudson
Bergen	1	PSEG	F	27	290	O*	---	Ridgefield Pk.	Bergen
	2		F	27	290	O*	---		
	3		CT	14	15	G	---		
B.L. England	1	ACE	F	120	127	C	OT	Upper Twp.	Cape May
	2		F	160	160	C	OT		
	3		F	160	160	O	CL		
	Diesel		D	8	8	O	AIR		
Burlington	5	PSEG	F	118	123	O*	OT	Burlington	Burlington
	6		F	120	128	O*	OT		
	7		F	180	185	O*	OT		
	8		CT	14	15	O	OT		
	9		CT	141	172	O	AIR		
	10		CT	70	86	O	AIR		
	10		CC	107	122	-	OT		
	11		CT	141	172	O	AIR		
Carlls Corner	1&2	ACE	CT	74	92	O	AIR	Upper Deerfield	Cumberland
Cedar	1	ACE	CT	46	53	O	AIR	Stafford Twp.	Ocean
	2		CT	23	26	O	AIR		
Deepwater	1	ACE	F	78	82	O	OT	Lower Penns Neck	Salem
	3		F	53	54	O	OT		
	4		F	54	54	O	OT		
	5		F	24	24	O	---		
	6		F	80	81	O/G	OT		
	7		F	25	25	O	---		
	A		CT	17	22	O/G	AIR		
Edison	1,2,3	PSEG	CT	360	456	O	AIR	Edison	Middlesex

Station	Unit No.	Company	Type	Normal New MW Capacity		Primary Fuel	Cooling	Location	
				Summer	Winter			Municipality	County
Essex	1	PSEG	F	104	110	O	OT	Newark	Essex
	9		CT	47	60	O	AIR		
	10		CT	120	152	O	AIR		
	11		CT	141	172	O	AIR		
	12		CT	141	172	O	AIR		
Gilbert	1,2	JCPL	F	45	46	O	OT	Holland Twp.	Hunterdon
	3		F	72	73	O	AIR		
	C_1-C_4		CT	100	124	O	AIR		
	4-7		CT	224	288	O	AIR		
Glen Gardner	A-1-8	JCPL	CT	160	208	O	AIR	Lebanon Twp.	Hunterdon
Hudson	1	PSEG	F	383	415	O*	OT	Jersey City	Hudson
	2		F	600	620	C	OT		
	3		CT	104	120	O	OT		
Kearny	7	PSEG	F	142	148	O*	OT	Kearny	Hudson
	8		F	146	148	O*	OT		
	9		CT	14	15	G	AIR		
	10		CT	120	120	O	OT		
	11		CT	120	120	O	OT		
	12		CT	150	280	O	AIR		
Linden	1,4	PSEG	F	244	284	O	OT	Linden	Union
	2		F	225	225	O	OT		
	3		CT	14	15	G	AIR		
	5-8		CT	96	120	O	AIR		
	9		CT	150	208	O	AIR		
Mercer	1	PSEG	F	296	300	C	OT	Hamilton Twp.	Mercer
	2		F	290	300	C	OT		
	3		CT	104	120	G	---		
Mickleton	1	ACE	CT	57	79	O	AIR	E.Greenwich Twp.	Gloucester

Station	Unit No.	Company	Type	Normal New MW Capacity		Primary Fuel	Cooling	Location	
				Summer	Winter			Municipality	County
Middle	1,2	ACE	CT	40	48	O	AIR	Middle Twp.	Cape May
	3		CT	37	45	O	AIR		
National Park	1	PSEG	CT	15	18	O	AIR	National Park	Burlington
Oyster Creek	1	JCPL	N	620	650	N	OT	Lacey Twp.	Ocean
Riegel	1	JCPL	CT	22	28	G	AIR	Milford	Hunterdon
Salem	3	J[3]	CT	38	42	O	AIR	Lower Alloways Creek	Middlesex
Salem	1	J[3]	N	1090	1090	N	OT	Lower Alloways Creek	Middlesex
Sayreville	1-3	JCPL	F	84	90	O	OT	Sayreville	Middlesex
	4		F	118	126	O	OT		
	5		F	123	127	O	OT		
	C_1-C_4		CT	212	292	O	AIR		
Sewaren	1	PSEG	F	104	107	O*	OT	Woodbridge	Middlesex
	2		F	111	113	O*	OT		
	3		F	107	109	O*	OT		
	4		F	124	127	O*	OT		
	5		F	326	344	O	OT		
	6		CT	52	60	O	OT		
Vineland	1	Vineland	CT	29	35	O	AIR	Vineland	Cumberland
	4,5,6		F	7	7	O	SP		
	7		F	8	8	O	OT		
	8		F	12	12	O	OT		
	9		F	17	17	O	OT		
	10		F	23	23	O	OT		
Werner	1,3	JCPL	F	30	34	O	OT	South Amboy	Middlesex
	4		F	58	60	O	OT		
	C_1-C_4		CT	212	292	O	AIR		
Yards Creek	1,2,3	J[4]	PH	330	330		---	Blairstown	Warren

B. Major Plants Proposed or Under Construction

Station	Unit No.	Company	Type	New MW Capacity	Primary Fuel	Cooling	Location Municipality	County
Salem[5]	2(1979)	J[3]	N	1115	N	OT		
Hope Creek[7]	1(1982)	J[8]	N	1100	N	CL	Lower Alloways Creek Township	Salem
Forked River[9]	1(1982)	JCPL	N	1120	N	CL	Lacey Township	Ocean
Hope Creek[7]	2(1984)	J[8]	N	1100	N	CL		
Atlantic[9]	1(1985)	J[10]	N	1150	N	OT	Offshore	
Atlantic[9]	2(1987)		N	1150	N	OT	Atlantic City	

C. Footnotes to Table 5

*Coal burning equipment in place.

1. In addition to plants in New Jersey, several New Jersey electric Utilities own major shares in three plants in Pennsylvania.

   Peach Bottom Nuclear Plant, Peach Bottom, Pennsylvania, 2 units, 2090 MW (normal winter rating), PSEG: 888 MW; ACE: 78.5 MW.

   Conemaugh "minemouth" Coal Plant, West Wheatfield, Pennsylvania, 6 units, 611 MW (normal winter rating), PSEG: 302 MW; ACE: MW; ACE: 21 MW; GPU 143.5 MW.

2. When units are listed on the same line, capacity listed refers to combined capacity.

3. PSE&G: 42.55%; Philadelphia Electric Company (PEC): 42.55%; ACE: 7.45%; Delmarva Power and Light (DPL): 7.45%.

4. JCPL: 50%, PSEG: 50%.

5. Project exempt from CAFRA as construction commenced prior to September 19, 1973.

6. Dates in parenthesis represent expected first year of operation.

7. Issued conditional CAFRA permit January 28, 1976.

8. PSEG: 90%; ACE: 10%.

9. CAFRA permit pending.

10. PSEG: 80%; ACE: 10%; JCPL: 10%.

Utilities make use of gas turbines to supplement electrical generation when demand is high.

In 1976, over twenty-four percent of New Jersey's electric power was generated by nuclear energy, even though nuclear power constitutes only two percent of New Jersey's total energy consumption.[10]

a. Nuclear Power

Nuclear power in New Jersey is provided by the Oyster Creek plant, operated by Jersey Central Power and Light Company and owned by the General Public Utilities Corporation (GPU) and the Salem plant in Lower Alloways Creek, which began operating in December 1976. GPU generates 54 percent of its electricity from the Oyster Creek plant and the Three Mile Island nuclear unit in Pennsylvania. Public Service Electric and Gas Company, which supplies 80 percent of New Jersey's 7.5 million customers, meets 15 percent of its electric needs with nuclear energy from its Peach Bottom plant in Pennsylvania. Atlantic City Electric, through its share in the Pennsylvania Peach Bottom plant, met 18 percent of its electric needs with nuclear energy in 1976 and expects to increase this to 27 percent in 1977.[11]

b. Nuclear versus Coal

Utilities claim that one of the advantages of nuclear power is that it is less costly than petroleum, gas or coal. Indeed, each of the three investor-owned utilities claimed in their 1975 Annual Reports that the use of nuclear power was responsible for keeping down the cost of electricity.[12] The major expense with nuclear plants involves their high capital cost. Fossil fuel plants are less expensive to build but incur higher operating and fuel costs. How long nuclear power plants can maintain this cost advantage is not clear since both capital and fuel costs have been rising precipitously since 1974.[13] Indeed, studies have been conducted which would dispute the cost advantage of nuclear power over coal, claiming the two to be about equal.[14]

c. Future Demand for Electricity

The figures which the utilities have submitted to the Public Utility Commission in the New Jersey Master Siting Plan indicate they anticipate energy demand to almost double over a 15 year period, from 13,000 megawatts (MW) to 25,000 MW at a rate of 4 1/2 percent per year.[15] These figures include reserves for equipment failures. About one-third of this electricity (or 7,825 MW) is expected to be generated by nuclear fuel.

Whether the utilities will be able to continue to increase their nuclear capacity is an open question because of the problems which nuclear energy is posing in terms of storage, disposal, operations and public resistance.

An issue is whether the growth rates forecast by utilities are valid since even a one percent differential could mean the difference between building or not building the power plant. Until recently energy growth rates predicted by utilities went unchallenged. Now, with fuel curtailments, constantly-rising prices and adverse environmental impacts associated with building electric generating stations, utility forecasts are coming under closer scrutiny. The 4 1/2 percent annual growth rate now predicted by New Jersey utilities for 1975-1989 is much lower than the 7.5 percent annual growth experienced between 1963 and 1973. Whether these lower projections are low enough is under review by the Public Utility Commission, which for the first time in its history is holding hearings on the energy growth plans of utilities.[16]

Resistance to power plants, particularly nuclear plants, with their attendant environmental problems and risks is understandable because, in the haste to industrialize, New Jersey sacrificed large segments of land, rivers and waterfront, especially in the northeast, to development. New Jerseyans are possibly more sensitive today, therefore, to the effects of industrialization than previously. This is so, even with the benefit of hindsight which gives the state the authority to ensure that the blight associated with yester-year's development is not repeated. It is a fact, however, that in 1976 New Jersey was an importer of electric energy when half of the nuclear generated electricity came from the Peach Bottom Plant in Pennsylvania.[17] Resistant though it may be to more power plants, New Jersey cannot expect other states to incur risks and environmental degradation on its behalf that it is unwilling to incur within its own boundaries.

The next chapter discusses some of the alternatives which might reduce the pressure to build more power plants in the coastal zone.

Footnotes

[1]New Jersey Manufacturers Association Energy Council, "Energy and New Jersey's Economy -- 1975 and Beyond, April, 1976, p. 1.

[2]American Petroleum Institute, Basic Petroleum Data Book, Table 6, October, 1976.

[3]U.S. Department of the Interior, Draft Environmental Statement, Proposed 1977, Outer Continental Shell Oil and Gas Lease Sale, Offshore the North Atlantic States, OCS Sale #42 (1976). The U.S. Department of the Interior noted that oil production from the Georges Bank "...is considered most likely to be tankered to existing refineries in the northern New Jersey or Delaware River Basin areas", p. 5, vol. 1.

[4]The twelve companies which will be heading up off shore operations in the Baltimore Canyon are listed in Table 7.

[5]N.J. Governor's Task Force on Energy, Energy - a Report to the Governor of New Jersey, May 1974. Federal Energy Administration, "Gross Energy Consumption Total", Mimeograph computer printout, September 30, 1976, and Table 1.

[6]Minde, Theodore, A., "How New Jersey Industry Uses Natural Gas" - reprint from New Jersey Economic Indicators, May 30, 1976.

[7]Ibid.

[8]Public Service Electric and Gas Company, 1975 Annual Report, p. 11.

[9]U.S. Department of the Interior, Final Environmental Impact Statement, Lease Sale #40, May 1976.

[10]Data provided by Louis DeMattheis, Public Service Electric and Gas Company, March 21, 1977.

[11]Communication by Fred Abbate, Atlantic City Electric Company, February 22, 1977.

[12]Public Service Electric and Gas Company stated in its Annual Report that its customers saved $80 million in 1975 due to nuclear versus fossil fuel usage. Jersey Central Power and Light Company noted that 53 percent of its power was supplied by nuclear power; and that its customers saved $70 million by using nuclear power. Atlantic City Electric noted that it too saved by using nuclear power: 2.7 cents versus 31.8 cents for the fossil fuel equivalent.

[13]"Fuel Shortage Forecast for U.S. Nuclear Plants within Decade or Two", Wall Street Journal, June 7, 1976, p. 1. The article indicated that the price of fuel went from $8.00 per pound in January 1974 to $35.00 per pound in January 1976.

[14]See, for example, Dubin-Bloome Associates, P. C. New York, A Study of Electric Energy Usage in the Public Electric and Gas Company, Service Territory State of New Jersey, Prepared for the Public Rate Counsel, Department of the Public Advocate, June 30, 1976 and Charles Komanoff, "Power Plant Performance" Council on Economic Priorities, New York 1976. See also, Nuclear Power Issues and Choices, by the Mitre Corporation, sponsored by the Ford Foundation, (Cambridge-Ballinger Publishing Co., 1977).

[15]Public Service Electric and Gas Company et al, N.J. Master Siting Plan: Major Electric Generating Projects 1975-1989, January 1975.

[16]Hearings on utility projections began February 7, 1977 before the Public Utility Commission.

[17]New Jersey utilities generated 10.7 billion killowatt hours of electricity including 4.9 billion Kilowatt hours from Public Service Electric and Gas Company's, Peach Bottom plant.

III. ENERGY CONSERVATION AND ALTERNATIVE TECHNOLOGIES

There is general agreement among geologists that the United States is well on its way to depleting its oil and gas resources. There is no consensus, however, whether this will be in thirty or sixty or more years.[1] The rate of depletion of United States energy resources depends on a number of factors, including technology and price. Advances in technology, for example, would make it possible to extract oil and gas reserves considered marginal or even uneconomic in the past. As long as price plays an important role, it is not easy to obtain a clear answer from geologists or the industry as to the absolute energy resources in the ground except that the United States is well on its way to depleting its oil and natural resources.

This section discusses conservation and alternative technologies, including coal, solar and wind energy, which may come into wider use in New Jersey within the next ten or more years. They are discussed in this paper because they may be the energy sources on which we may have to increasingly depend as oil and natural gas supplies decline. These alternatives should be considered in the energy element of any state's coastal zone management program.

A. Conservation

Conservation in this discussion means using energy more efficiently. Conservation could reduce pressure on the coast to build more and larger energy facilities. In addition, it should be viewed as the bridge between declining oil and gas supplies and the newer technologies afforded by solar, wind and coal energy.

The impetus for states to develop energy conservation programs is provided by the federal Energy Policy and Conservation Act 1975 (EPCA). This Act provides financial assistance for states to develop energy conservation plans and reduce energy demand by five percent by 1980. A five percent reduction in energy consumption in New Jersey represents 97 trillion British Thermal units (BTU's), the equivalent of one billion gallons of oil.

The former State Energy Office (incorporated into the new Department of Energy) submitted New Jersey's energy conservation plan to the Federal Energy Administration in April 1977. New Jersey's conservation plan includes phasing out of gas pilot lights, which consume about 8.2 percent of New Jersey's natural gas. The State Energy Office projected energy savings of 60 percent in the residential and commercial sectors, 30 percent in the industrial and 10 percent in the transportation sectors.

Each of the main sectors of the economy -- transportation, commercial, residential, industry and utilities -- offer opportunities for achieving energy conservation. They are discussed briefly below.

1. Transportation and Land Use

The automobile has, of course, had the greatest impact on dispersing land uses and increasing energy consumption. In 1976, the nation's transportation sector, of which the automobile is the principal element, consumed 6,960,000 barrels of oil per day. This is the equivalent of 40 percent of the daily demand of 17,280,000 barrels of oil,[3] or 67 percent of our daily domestic oil production. While state government can provide incentives and sanctions for car and van pooling, pressure has to be applied on the industry to produce more efficient gasoline engines or to develop battery powered engines.

Not only is the automobile a significant consumer of energy, but it has had a revolutionary effect on dispersing land uses and human settlements. Most notably it has produced suburbia, a notorious consumer of energy and land resources.

The Cost of Sprawl, a recent study for the Council on Environmental Quality (CEQ), shows that significant energy savings can be achieved by cluster and planned unit developments in contrast to the grid patterns which are so costly in terms of laying down roads and utility lines. The CEQ study found, for example, that clusterd developments can save 8.14 percent energy as a result of reduced auto travel, and lessen air pollution, while at the same time conserving open space and preserving wildlife. The study also found that shopping centers were 20 percent less costly to build and service than shops built along strips of highway.[4]

While it is too late to change existing land uses, the New Jersey Office of Coastal Zone Management has the opportunity under CAFRA, the Federal Coastal Zone Management Act and implementation of the State's energy conservation plan under EPCA to ensure that developers and local planning agencies consider clustering and planned unit developments as alternatives to the traditional patterns of land development.

2. Residential and Commercial

Space heating constitutes a major item of energy used in the residential and commercial sectors. Rising fuel bills and the severe winter of 1977 exposed a major weakness in the construction of homes and buildings. Many people in self-defense insulated their homes to keep in the heat. New Jersey's energy conservation plan provides incentives for a more organized home insulation program.

Energy conservation building codes are probably the most efficient mechanism for producing energy consumption savings in the home and commercial sector. Updated codes should, for example, prohibit the type of office building that it is totally dependent on year-round air conditioning, heat and ventilation. As of 1977, New Jersey has a Uniform Construction Code, enacted to standardize the various municipal building codes. Energy sub-code regulations to be issued later in 1977 will address insulation, glazing of windows, lighting and the like.[5]

3. Industry

Industry provides many opportunities to conserve energy both in the way that it uses energy and in the products that it makes, such as automobiles, boilers and appliances. EPCA, for example, mandates that automobile manufacturers produce more energy efficient cars and that industry label electric appliances as to their energy efficiency.

One of the most substantial impacts that large industries could have on conservation would be to adopt cogeneration as a way of doing business. Cogeneration is the process hereby one unit of energy is used twice resulting in a net energy saving. It is used mostly by steam-using plants which can use the energy to first generate electricity and then reuse it at a lower temperature to provide steam. Excess electricity, beyond industry's needs, is delivered to the utility. In West Germany, cogeneration provides 29 percent of the country's electricity in contrast with the United States where cogeneration constitutes only four percent of electricity produced. New Jersey provides two percent of its electricity through cogeneration. It has been estimated that the state could increase industrial electricity substantially through its large number of steam-using industries, such as large food and chemical plants.[6]

To be successful, excess electricity has to be fed into the utility's grid system. This presents a potential problem since this would necessitate new agreements between industry and utilities, as well as initial costs for equipment to hook up industry and utility equipment. While the incentive for such arrangements never existed in the past when energy was cheap and when discounts were offered to large volume users, this situation no longer holds. Under a rigidly enforced conservation program, incentives to cogenerate electricity could be provided, at least, during the initial start up period. Beneficial spin-offs of cogeneration to the utilities include reduction in the need for peaking equipment and the assurance of dependable supplies of electricity during peak periods. The sale of excess electricity to the utility on a guaranteed basis would thus help the latter in meeting peak load demand and possibly reducing the need for new generating equipment.

Heat recovery is another way in which industries could conserve energy. Counties and municipalities, faced with enormous solid waste problems, spend money transporting garbage to landfill sites and spend time worrying about where to find new sites for landfills. Methane, a byproduct of solid waste combustion, is an adequate substitute for natural gas which was in such short in January and February of 1977. Such gas could be used to run generators. It would be much more beneficial to recover heat energy from solid waste than dot the landscape with landfills which preempt other land uses.

Sludge could also be recovered and converted to heat. At present sludge is dumped at sea at considerable financial and environmental cost. The burning of sludge could produce gas which could be used to power gas generators. Not only would the sludge be recycled to produce energy, but it could help save the

ocean adjacent to New Jersey which through algae bloom and fishkills in 1976 served notice that its capacity to absorb wastes was not unlimited. The technology of resource recovery is new. What is needed to make it marketable are incentives and, possibly, demonstration grants. Such incentives must come from both the state and federal government. New Jersey should also lobby the federal government to restructure interstate freight rates in favor of transporting recycled rather than virgin materials.

4. Utilities

Utilities are both producers and consumers of energy. As consumers, they are becoming increasingly significant as Table 2, Section II shows. Possibly the greatest contribution that utilities could make to energy conservation would be to reduce peak demand. Peak demand is the load which customers place on the generating system during extreme periods of heat or cold when everyone turns on the power switch at once. Peaks occur on a daily basis, on mornings and evenings, for example, as people are leaving and returning from work. Seasonal peaks can occur on a hot and humid summer's day when everyone turns on their air conditioning or in the depth of winter when everyone turns up thermostats simultaneously. Peak loads are generated more frequently on an average in the winter than in the summer.

"Base" load represents the consumer's average demand on the electric generating system of the utilities. Peak demand constitutes the highest demand that a customer will make on a utility at any time. Utilities project their need for new power plants and equipment on peak rather than base loads.

Utilities have a duty to supply peak loads even when these occur only infrequently. To meet these peaks they have to build equipment which is expensive but which stands idle for much of the year representing a loss of valuable resources. Some New Jersey utilities supplement their base loads (regular operating equipment) with gas turbines. These turbines are more expensive in terms of operating costs though they are less expensive in terms of capital. Some utilities, however, build peaking units solely to satisfy peak demands. From an economist's point of view such an investment is a poor one. From an environmental point of view, such plants, in that they preempt other uses to which the land they occupy could be used, represent a lost opportunity, since power plants usually locate adjacent to rivers, streams or shoreland on which society places a premium.

There is no real incentive, however, for utilities to seek alternative ways of meeting peak demands because they are entitled by law to a fixed return on their capital investment. A reduction in peak demand could, however, mean the building of fewer plants. Recent studies indicate that a reduction of even one percent in the growth rate can reduce peak demands and sometimes the need for additional power plants.[7]

Reducing or leveling peak demand through rate restructuring has been suggested as one way of lowering peak demand and reducing the need for peak capacity or equipment. Both Public Service Electric and Gas (PSE&G) and Jersey Central Power and Light (JCP&L) are experimenting with this. The rationale behind restructuring rates is to offer price incentives to the customers so they will find it more profitable to use appliances during off peak hours and promote greater efficiency of generating equipment around the clock. The extent to which people will allow rates to influence their lifestyle is the subject of PSE&G and JCP&L studies. Price restructuring, it is believed, will encourage energy conservation. Traditionally it has been the high volume (industrial) user, who has profited from discounts rather than the low volume residential user who has had to pay a minimum fee for power whether or not it is used. Restructuring industrial rates needs more study since some users have to use a fixed amount of energy in the manufacturing process. Altering the rate structure could be economically detrimental. This is, naturally, why large volume industrial users of energy should investigate the feasibility of cogeneration.

B. Coal

Coal, which was at one time New Jersey's principal energy source, today constitutes 3.5 percent of New Jersey's energy supply. Emissions, high handling and transportation costs have all but eliminated its use in favor of the cheaper oil and gas. With rising prices, depletion of domestic oil and gas sources, growing dependence on foreign energy sources and the advent of nuclear power, coal is being looked upon anew, especially as United States recoverable reserves of coal are on the order of 150 billion tons of which we only used 665 million tons in 1976, or less than one half of one percent.[8]

Unfortunately, 93 percent of low sulfur coal, the only kind that federal regulations permit to be burned, is located in the West. To make coal burning in the East feasible, pollution control technology is needed to remove sulfur from the coal. Some of this technology, such as scrubbers, is available but is expensive. It is unlikely, therefore, that utilities will generally install expensive pollution controls until other energy becomes as or more expensive.

There is a considerable ongoing debate concerning the cost of coal versus nuclear power, with both proponents and opponents claiming a cost advantage. A cost comparison, however, includes so many variables on which debaters place different weights, that objectivity is hard to come by. What can be said, however, is that the difference in cost between nuclear and coal plants is narrowing rapidly to the point where they may be considered almost about equal.[9]

While traditionally it has been soft, bituminous coal which has been burnt by the utilities, the New Jersey Department of Environmental Protection has been looking at anthracite coal which has a low sulfur content but which cannot be burned in existing boilers because of its hard properties,[10] which make it difficult to grind down to manageable proportions. The use of anthracite coal would entail changing boiler equipment and result in higher prices, at least during the switchover period. Again, tax credits might have to be offered to make the switch more palatable to utilities.

C. Solar Energy

From a pollution perspective solar energy is nearly ideal. The problem has been to concentrate this energy (2.4×10^{21} BTU's per year) which is dispersed at a relative low intensity over the earth.[11] While research is underway to harness solar power in the future to generate electricity, solar heating and cooling systems are already commercially available in New Jersey.

The most simple or "passive", method of solar heating consists of capturing sunlight through a glass and dark metal collector, with the glass trapping the energy and the dark metal serving to convert it to heat. The heat is then stored in air or water containers and conducted through space by convection. Passive solar systems can also incorporate design features in buildings to take advantage of the sun's daily and seasonal patterns. A more sophisticated "active system" uses pipes and valves to circulate the heat to where it is needed. Heat could be stored for several days in New Jersey even when the sun is not shining; however, most solar energy users today rely on backup fossil-fueled or electrical system to tie them over during prolonged sunless periods. The application of sunlight for cooling and air conditioning is based on the same principle as that for heating - only in reverse. Solar receptor panels, which are normally opened to let in the sun for heat, are closed during the day and opened at night to use the radiant cooling power available from the night air.

D. Wind Energy

The marketing of wind systems seems to be further away than solar energy systems. More needs to be known about the capacity of the wind to produce energy on a continuing basis. Also more needs to be known about the optional size and capacity of wind generators and the market that these might serve. Unlike solar energy, wind cannot be directly stored. This means that consumers may need backup systems. These are questions which need to be further studied. If wind and solar energy are the energy resources of the future, builders and architects will have to give more attention to siting such facilities so that the efficiency of these resources will be maximized.

E. Other Sources

Geothermal energy, which comes from hot springs, has not been discussed because New Jersey does not have such springs. Hydro-electric power has not been discussed either, in view of New Jersey's potential for this source.

F. Conclusion

This chapter has discussed some short- and long-term alternatives to today's energy resources. As long as New Jersey is heavily reliant on foreign fuels, this state will probably have to pursue the various options in tandem until one or two energy technologies emerge which particularly favor the New Jersey economy.

Hindering the New Jersey Office of Coastal Zone Management's energy facility siting planning is a lack of consensus concerning New Jersey's future. If rapid growth, as the utilities would have one believe, is to be the goal, then more energy facilities will be needed. On the other hand, if the State's future has slower growth or (not likely) zero growth, it may not be necessary to build some of the large scale, high investment facilities projected for the next decade. In the latter case, a strict program of conservation and the introduction of more energy efficient technologies such as cogeneration, plus solar and wind power, could start to replace some of the large scale facilities which have such a large impact on surrounding coastal land and water systems. There may be a trend towards at least slower growth, as the state undergoes the agonizing switch from a manufacturing to a service economy and as it is losing its traditional industrial base.

Footnotes

[1]See U.S. Geological Circular #725, "Geological Estimates of Undiscovered Recoverable Oil and Gas Resources in the United States", U.S. Geological Survey, Reston, Va., 1975.

[2]Energy Policy and Conservation Act of 1975.

[3]Oil and Gas Journal, January 31, 1977, page 107.

[4]Real Estate Research Corp., The Cost of Sprawl, prepared for the Council of Environmental Quality, April 1974 page 15, 24, 11-13. Table 4 showed that utilities in high density planned communities cost $3,335.00 in contrast to $5,151.00 and were 64 percent less expensive than utility lines in sprawled out developments. The study pointed out, however, that high concentrated development produces air pollution which is not present in the low sprawl situation.

[5]Uniform Construction Code, P.L. 1975, New Jersey Administrative Code Chapter 23 Title 5.

[6]Roger W. Williams, The Potential for Electricity Generation as a Product of Industrial Steam Production in New Jersey, Princeton University, Center for Environmental Studies; Report #31, June 1976.

[7]See, Peter M. Meier and David Morell, Issues in Clustered Nuclear Siting, Policy Analysis Division, Brookhaven National Laboratory, New York, September 1976, p. 10 and Dubin-Bloome Associates, A Study of Electrical Energy Usage in the Public Service Electric and Gas Company, Service Territory of New Jersey, June 1976, Figure 1-4, p. 19.

[8]USGS estimates that total coal resources approximate 3.21 trillion tons, National Petroleum Council, U.S. Energy Outlook, December 1972, page 135. The 665 million tons figure comes from the Federal Energy Administration. It includes bituminous and lignite coal, but not anthracite coal.

[9]See, for example, Charles Komanoff, Power Plant Performance, Council on Economic Priorities, New York, 1976. The study compares nuclear and coal capacity factors among the variables. Capacity factor is the net generating capacity over a year. The study shows that while projected at 70-80%, nuclear plants through the year 1975 have actively operated at 59.3 percent. Coal plants have performed at 66.9 percent between 1960-1973. This has been criticized by the Federal Energy Administration.

[10]Anthracite coal is hard coal. It has a lower volatility than soft bituminous coal and would require utilities to make change in design if used in existing boilers.

[11]University of Oklahoma, Science and Public Policy Program, Energy Alternatives: A Comparative Analysis, May 1975, page II-3. Note that the U.S. uses about 15 quads (15×10^{15} per year). 2.4×10^{21} represents 18,000 times of much energy as is consumed world-wide.

IV. PROPOSED ENERGY FACILITIES

This section describes the environmental and land use implications associated with siting energy facilities which have been proposed for the coastal zone. The range of facilities includes Outer Continental Shelf (OCS) exploration and development activities, nuclear and conventional electric generating stations, liquified natural gas (LNG) terminals and deepwater ports.

A. Outer Continental Shelf Exploration and Development

1. Issues

New Jersey's strategic location adjacent to the Baltimore Canyon in the Atlantic Ocean could make the state a center for OCS activities and add impetus to its petrochemical industry, which is already New Jersey's leading industry.[1] The development of hydrocarbon resources might also increase New Jersey's access to oil and, especially natural gas, making it less vulnerable to the type of curtailments which closed schools, and plants and laid off workers in January and February of 1977.

Some, noting that oil and gas reserves in the Baltimore Canyon may be equivalent to less than six months of total United States consumption of oil, question whether the disruption to the environment is worth the benefit. They are opposed not only by industrial and pro-development groups, but also by the southern oil producing states who are questioning why they should continue to supply New Jersey with hydrocarbon fuels with sacrifice to themselves while New Jersey is unwilling to make the same sacrifice. (This assertion ignores that New Jersey has all of the petroleum fuel cycle except the production of crude oil.)

Generally, however, the OCS issue concerns mitigation of the adverse impacts of OCS development rather than outright opposition. Even spokesmen for the three counties of Ocean, Atlantic and Cape May, which are involved in the law suit which voided the August 1976 lease sale, have stated that they are not so much opposed to offshore development *per se* as they are to the manner in which it is being done by the U.S. Department of Interior's Bureau of Land Management.

The State's position, espoused by the Governor of New Jersey in testimony in Atlantic City on the draft Environmental Impact Statement prepared as part of the process of leasing offshore tracts before the Bureau of Land Management in January 1976, has been to strike a balance. In that testimony, the Governor opposed "refinery construction on the beaches or any other development... incongruous to the special character and lifestyle of New Jersey's seashore towns", and welcomed the "establishment of OCS-related onshore facilities that are compatible with the coastal environment and...[the] economic interest in tourism".[1]

2. Background

Depletion and the resulting cutback in production of domestic gas and oil and the increasing dependence on foreign fuels resulted in a presidential directive in 1973 to accelerate exploration of frontier areas, including the Outer Continental Shelf lands adjacent to New Jersey's coastal waters (known as the Baltimore Canyon) for new sources of these fuels. Geologists believe that sediments in the Baltimore Canyon are similar to those found in the Gulf of Mexico and that the Baltimore Canyon may hold sizable hydrocarbon reserves.[2]

The U.S. Department of the Interior shortly thereafter scheduled two lease sales in the Baltimore Canyon: lease sale #40 and #49. Interior has also scheduled lease sale #42 in the North Atlantic Ocean offshore Massachusetts on the Georges Bank. Lease sale #40 took place in August 1976. Lease Sale #42 is now scheduled for 1978 and Lease Sale #49 for 1979. Lease Sale #40 yielded $1.1 billion in bids for 93 tracts leased; companies which were successful in obtaining leases are listed in Table 7. The location of tracts leased in August 1976 are illustrated in Figure 5. It should be noted that the majority of the oil companies which obtained leases in August 1976 have oil refineries either in northeastern New Jersey (Chevron, Exxon, and Amerada Hess), or on the New Jersey side of the Delaware River (Mobil and Texaco), or across the Delaware River in Pennsylvania (Atlantic Richfield, Gulf and Sun) or in Delaware City, Delaware (Getty Oil). Only Shell Oil, the second highest bidder with fifteen tracts, has no refineries in this region, but does own a large tract of land in Gloucester county along the Delaware River, where construction of a refinery was once proposed.

If the U.S. Department of the Interior's projections are correct, 1.4 billion barrels of oil and 9.4 trillion cubic feet of gas could ultimately be recovered from this sale over a twenty to twenty-five year period.[3] This breaks down to 16 million barrels a year or 43,835 barrels per day in the low case and 56 million barrels a year or 153,424 barrels a day in the high case. If these federal estimates are correct and if the current United States demand of 17 million barrels a day stays constant, OCS resources from Lease Sale 40 would contribute only one-fourth of one percent in the low case and nine-tenths of one percent in the high case. Put still another way, Lease Sale 40 would provide 23.5 days of the nation's current oil consumption in the low case and 82.3 days of its consumption in the high case. Increasing demand could, however, reduce Lease Sale 40's relative contribution to the nation's oil supply still further.

The Natural Resources Defense Council, Inc. (NRDC), several New York and New Jersey counties, and, for a time, the State of New York challenged in federal court the adequacy of the Environmental Impact Statement (EIS) filed by the Department of the Interior which accompanied the sale. The alleged inadequacies related to the failure of Interior to sufficiently address the powers which states and local governments have and might exercise to veto pipelines in state waters, notwithstanding federal preemption, as well as other issues.[4]

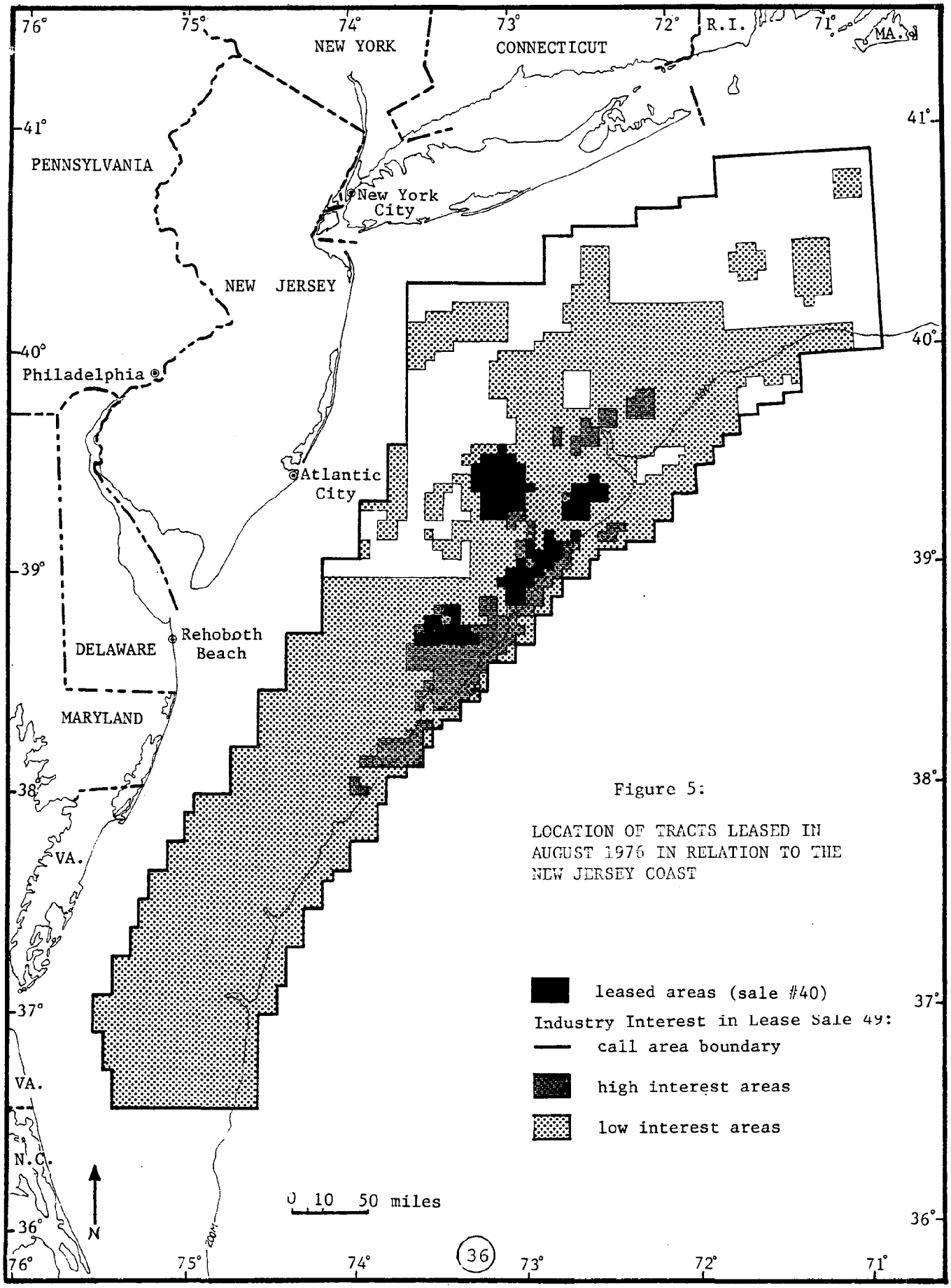


Figure 5:

LOCATION OF TRACTS LEASED IN AUGUST 1976 IN RELATION TO THE NEW JERSEY COAST

N.J. Department of Environmental Protection - Office of Coastal Zone Management

A February 1977 lower court decision was overturned in August 1977 by the U.S. Second Circuit Court of Appeals in New York which held that:

> While speculation in an EIS is not precluded...There comes a point when the chain of "ifs" gets too long and too tenuous to be of any practical use.[5]

Even so, the recently issued Final Environmental Impact Statement on Lease Sale 42 discusses potential pipeline routes from the Georges Bank to the coast of Rhode Island and Massachusetts. This indicates somewhat ironically that the litigation connected with Lease Sale 40 while not securing the assurances sought by the plaintiffs, did benefit analysis of the issues in the subsequent 42 sale.[6]

Table 6
Successful Bidders in Lease Sale #40
August 1976

Companies	Tracts Leased
Exxon	30
Chevron/Atlantic Richfield (This group also includes: Hamilton Brothers Oil Co., Murphy Oil Corp., Ocean Production Co., and ICI Delaware Inc.	13
Shell (This group includes: Cities Services Co., Continental Oil Co., Louisiana Land & Exploration Company, U.S. Steel Corp., Energy, Development Corp., (subsidiary of Public Service Electric and Gas of New Jersey) Sante Fe Minerals, Weeks Natural Resources, Inc., and General American Oil Co. of Texas)	12
Continental Oil	9
Murphy	8
Mobil Oil (This includes: Sun Oil Co., Getty Oil Co., Amerada Hess Corp., Diamond Shamrock Corps., and Anadarko Production Co.	7
Houston Oil and Minerals	4
Gulf Oil	3
Tenneco	2
Texaco (This group includes Skelly Oil, Allied Chemical and Transco.)	2
Transco	1
Sun Oil	1
Union Oil	1

Source: Derived from "Bid Recap By Area and Tract", U.S. Department of the Interior, Bureau of Land Management, Computer Printout, Report 1, Lease Sale 40, August 17, 1976.

Some companies expect to be drilling in the Atlantic Ocean before the end of 1977. Already they have filed a "Notice of Support Activity" in accordance with a stipulation attached to the leases acquired August 17, 1976. These Notices are addressed to the Governor of states affected by Lease Sale 40 and include information on expected facilities, employment and supplies required as a result of the Sale. As of this writing (September 1977) companies which have submitted "Notices" intend to use Atlantic City for their helicopter operations and Rhode Island as their support base. (See below for definition and function of Support Base).

The following are the major federal permits which are required before drilling can commence:

-Application for Permit to Drill from U.S. Geological Survey (30 CFR 250)

-Section 10 Permit from the U.S. Army Corps of Engineers (Rivers & Harbors Act). This permit is to construct, install, maintain and operate structures and appurtenances required for oil and gas drilling.

-National Pollution Discharge Elimination System (NPDES) from the U.S. Environmental Protection Agency (Federal Water Pollution Control Act of 1972). This covers discharges from drilling operations.

Before going further, it may be useful to describe what may be expected to occur should OCS development occur.

3. OCS Scenarios -- What to Expect

The first phase in OCS development is the exploration of the tracts to determine if the expected resources do, in fact, exist in commercial quantities. During this phase, companies will set up staging areas along the shore to permit supply and crew boats to service the rigs which will be drilling exploratory wells. Staging areas consist of docks and berthage space and require up to five acres of land for office space and open and closed warehousing for fuel and material storage. A helicopter pad is a necessary adjunct to such a facility. Staging area facilities may be shared by several companies to provide economies of scale. One major technical requirement of a staging area is that it have channel depth of between 15 and 20 feet for the service and crew boats shuttling back and forth to the offshore tracts. In New Jersey, the channel depth requirement may limit staging areas to the Port of New York and New Jersey, Atlantic City, Cold Spring Harbor in Cape May County and the harbors along the Delaware River. The exploration phase may last from one to five years, depending on the results of drilling. The most visible and audible impact in New Jersey during this phase may be the helicopters shuttling back and forth to the offshore rigs.

If exploration is successful, the stage could be set for development drilling, which constitutes Phase Two. Exploration and development frequently overlap. For example, development could take place one year following successful exploration in one area, while less successful exploration could continue for several more years without development drilling in other areas.

During the development stages, large steel drilling platforms will be built at some locations and floated into place offshore. Platform building is not expected to take place, at lease initially, in New Jersey. Instead, platforms may be built in the Gulf of Mexico, in shipyards along the Chesapeake Bay or in Newport News and floated into position. Permanent staging areas will also be sought. This might involve conversion of the temporary (exploration phase) base to permanent status. During the early development phase, associated industries which, for example, supply drilling mud and tools and diving services, will move into the area. During this phase, pipelines may be planned and built and land acquired for the storage of materials. In the late development stage, tank farms, processing plants and other facilities, such as booster stations (to pressurize oil and gas in pipelines to keep it flowing) may be built. Although tankers have not been ruled out, there is a strong likelihood that pipelines to shore will be constructed if at all economically feasible. It is during the development stage that economic impacts will be the greatest, with construction providing jobs and creating demands for services and housing. Access roads to activity centers may also be expected to be congested with trucks bringing in materials.

During the final phase of actual commercial production, which could begin five to six years following a lease sale, there will be a winding down of construction jobs and related activity, although services such as diving and provision of supplies for the rigs will continue. Production itself could last another ten to twenty years.

4. OCS Facilities

If OCS development takes place, a diversity of onshore facilities will be needed. For example, while oil can be landed by either tanker or pipeline, USGS stipulations require any oil found offshore to be pipelined where technically and economically feasible. Pipelines will be needed, if not for oil, then at least for gas because of the enormous expense involved in liquifying gas for shipment by tanker. New Jersey's refinery capacity may have to be expanded to refine the Baltimore Canyon oil, especially if New Jersey also becomes the refiner of any New England oil discoveries, as has been suggested in the Final Environmental Impact Statements prepared for New England's Lease Sale (#42) issued in 1977. Some refineries may also have to be retrofit or adjust their facilities to accommodate Atlantic Ocean oil, the chemical composition of which may be different from Gulf of Mexico or Arabian oil and which is presently an unknown. High sulfur oil, for example, requires different refining and processing than low sulfur oil. In the case of gas, processing plants would have to be built to remove impurities. New Jersey has little familiarity to date with such OCS gas processing plants, since none have ever been built here. Discussed below are some of the facilities which will have the largest environmental and socioeconomic impacts on New Jersey.

a. Pipelines

The nature of oil and gas make it infeasible to transport oil and gas in the same pipeline. While industry has the option of transporting oil by tanker or pipeline, this option does not exist for gas, because the processes of liquefying and reconverting it are very costly. Natural gas pipelines, at the very least, then, will be needed to land any Baltimore Canyon gas.

Ninety-eight percent of OCS oil is landed by pipeline in the United States. It is expected that any find in the Baltimore Canyon will also be landed this way. Only if the oil find were to be very low -- producing less than about 150,000 barrels per day according to industry officials -- would tankers be considered an alternative to pipelines.

The Final Environmental Impact Statement for Lease Sale #40 indicated that between 100 and 570 miles of pipeline might be needed. Many of these pipelines would constitute small diameter gathering lines connected to the various platforms in the offshore lease area. The oil coming ashore would be brought back in a large diameter, "common carrier" trunk line. Meters off and onshore ensure that oil from the different platforms is allocated and credited to the appropriate company.

The high cost of underwater pipelines ($1.75 million per mile) make it desirable that offshore lines be routed along the most direct path from platform to shore, except where other constraints, such as earthquake or other geological hazards, natural areas of overriding concern, shipping channels and the like, exist. A map of Lease Sale #40 (Figure 5) indicates that New Jersey's 124 mile ocean shoreline will be a prime candidate for any pipeline corridor. This has created great concern because of the potential disruption that such landfall might pose to the barrier islands, beaches and wetlands. Visits by officials of the N.J. Department of Environmental Protection to recently built oil and gas pipeline landfalls in Louisiana, Chesapeake Bay and the North Sea indicate that apart from temporary disturbances during construction, pipelines can be constructed with no long term adverse impacts. Inspection of landfalls in Chesapeake Bay and the North Shore showed that within one year of construction, natural vegetation and marsh communities reestablished themselves.

Fortunately, other facilities associated with pipelines, such as pumping stations, are not coastal-dependent and can be sited away from the beach, up to five miles inland. Because of scouring and wave action in inlets, it is likely that any pipelines which are permitted to come ashore in New Jersey will be routed across beaches rather than through inlets; this also would reduce conflicts with fishing and navigation.

Until oil and gas are actually discovered offshore and their quantity known, all attempts to locate pipeline corridors are speculative. Nevertheless, common sense indicates that the industry will prefer to link up any offshore pipelines to the New Jersey, Pennsylvania or Delaware refinery complexes. It is also possible that, in order to facilitate the acquisition of pipelines easements,

attempts will be made to use existing rights-of-way along highways and railroad beds.

One right-of-way that has been mentioned is the Atlantic City Expressway leading to Camden and the refineries bordering on the Delaware River. Currently, this also seems a preferable candidate from the point of view of avoiding offshore hazards such as sand waves, clam and fishing grounds, the Shrewsbury Rocks off Monmouth County, and shipping channels along the Delaware River in the south and Raritan Bay in the north.

One area through which pipelines should not be permitted (except perhaps along existing established rights-of-way, such as the Atlantic City Expressway) are the Pine Barrens 760 square miles of which have been singled out by the Department of Environmental Protection as a "critical area". The federal Environmental Protection Agency (E.P.A.) in responding to DEP's Call for Information on the siting of energy facilities in New Jersey noted that:

> We recommend that inland development be increased at already industrial areas instead of in more sensitive areas such as the Pine Barrens. This ecosystem is unique to the Northeast and is one of the last true wilderness areas in the state.[8]

While "inland development" is not defined, it does not seem unreasonable to infer that pipelines would be included in this recommendation.

Aside from their unique aesthetic aspect, the Pine Barrens are situated on a deepwater aquifer which might in the future serve as a drinking source for southern New Jersey. The presence of this water reservoir might, therefore, be another reason for ruling the Pine Barrens out as a place to locate a pipeline, or, at the least, to insure very stringent requirements to prevent pipeline ruptures.

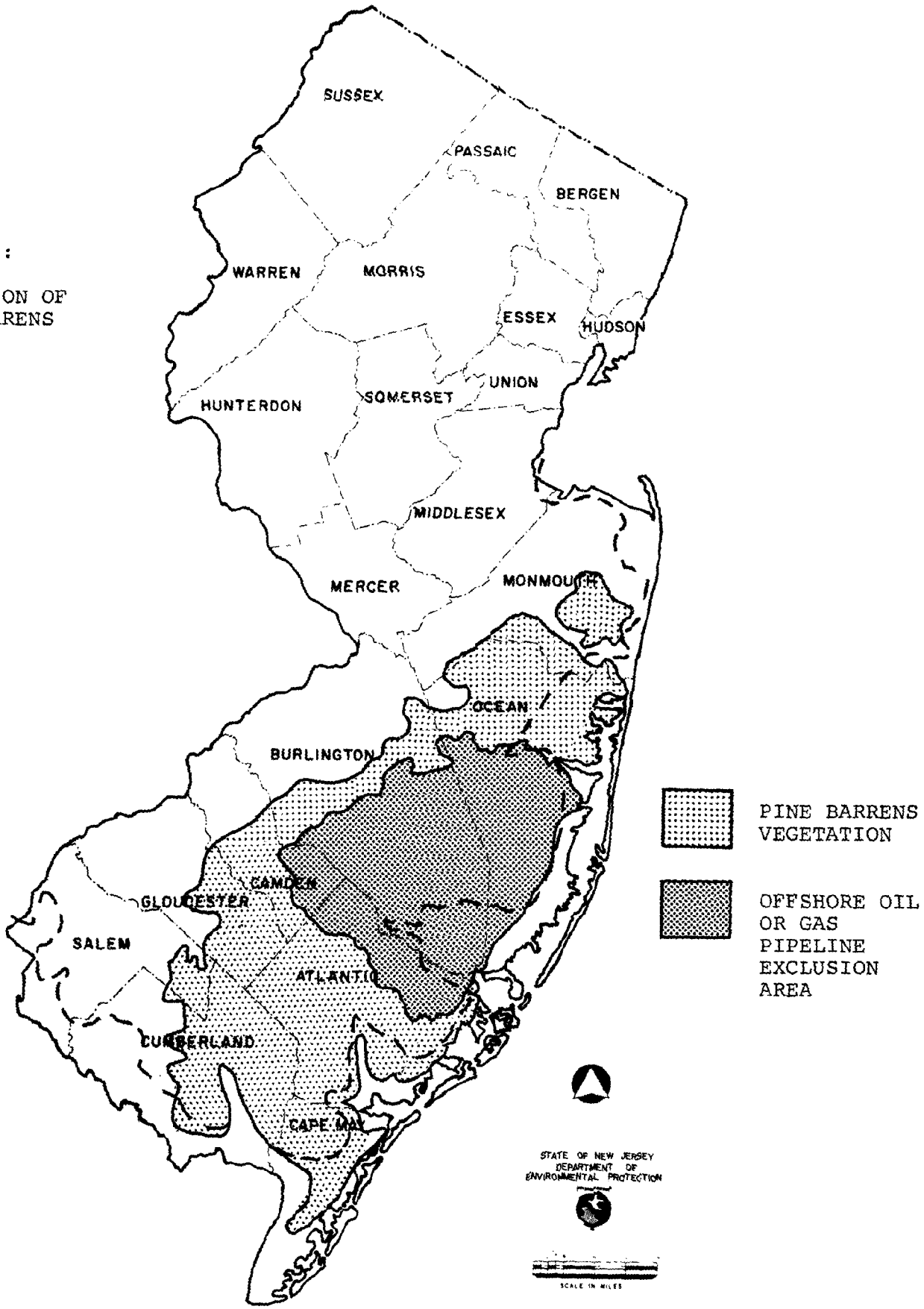
Figure 6 indicates the area in which offshore oil and gas pipelines should be excluded. This covers the Mullica River and Cedar Creek watersheds and portions of the Rancocas Creek and Toms River watersheds which DEP has identified as "critical" for water quality and sewerage purposes.

b) Natural Gas Processing Plants

In the event that natural gas were found offshore in significant quantities, gas processing plants would be needed and would constitute a new industrial activity in New Jersey. Such plants would have to be located close to the gas pipeline landfall, but not necessarily directly on the shoreline. The plants could be located up to ten miles from the shoreline. Gas processing plants do not require large amounts of land -- about ten acres per unit -- but they do create air emissions. The Final Environmental Impact Statement on Lease Sale #40 indicates that between three and eight plants might be needed. One plant can process between 300 to 500 million cubic feet of natural gas per day.

Figure 6:

DEFINITION OF PINE BARRENS



c) Refineries

The Department of the Interior's Environmental Impact Statements on Lease Sale #40 assumed that domestic crude would exactly replace foreign crude and that the existing capacity of refineries in this area would, therefore, be sufficient to process crude petroleum from the Baltimore Canyon. Nevertheless, some believe that petroleum from the Baltimore Canyon and Georges Bank may be added to (and not totally replace) foreign crude and that total petroleum demands in this area might grow. In this case there is a possibility that new or expanded refineries would be needed in New Jersey. In addition, because of the enormous investment involved in building a new refinery, it is possible that the Hess refinery, closed in 1974, with a capacity of 70,000 barrels a day, would be reopened. Nevertheless in today's economic market a 70,000 barrel refinery is considered small and refiners may still prefer to expand existing plants rather than refurbish the small Hess refinery.

Some planners believe it is preferable to cluster or contain industrial development in one or two regions within the state to protect the environment in other areas of the state. The decision to locate a refinery in a concentrated industrial complex might not, however, be possible because of air pollution control standards for the region which might be exceeded by a refinery. On the other hand, the location of a refinery in a comparatively pristine area, even if it were not to violate any air pollution standards, might arouse community opposition because of satellite industries which might start to locate nearby and produce adverse visual, aesthetic and odoriferous impacts. In addition, many New Jerseyans fear more refineries because of the potential carcinogens they have read might be related to petrochemical development. Others believe that New Jersey already has enough refineries and does not need the comparatively few new jobs -- about 400 -- that are associated with the average capital-intensive refinery operation.

Refineries are not dependent on coastal locations, but they have large cooling water requirements. They could thus be located on some inland waterway. To protect the biota in water systems from thermal effects, new refineries might need to be equipped with closed cycle cooling as well as the latest air pollution control and recovery systems to protect both public health and the environment.

d) Other Facilities

Other OCS facilities include support bases, repair yards, pipe coating yards and platform construction. At least for some, these are the facilities that it would be desirable to attract into New Jersey's coastal zone since they are labor-intensive, compatible with the marine environment and have no inherent polluting side effects. Where at all feasible, ancillary facilities such as pumping stations which are not dependent on waterfront access should be sited outside of the coastal area designated by CAFRA and two miles inland of the ten foot contour interval elsewhere in the state.

Footnotes

[1]Statement of Governor Brendan T. Byrne at the Department of the Interior's Hearings on the Draft EIS for the Proposed Mid-Atlantic Oil and Gas Lease Sale, Atlantic City, New Jersey, January 27, 1976.

[2]"Significant Possibilities Line Atlantic Shelf -- Offshore U.S. Theaters -4", Oil and Gas Journal, September 13, 1976, p. 116.

[3]U.S. Department of the Interior, "Proposed 1976 Outer Continental Shelf Oil and Gas Lease Sale Offshore the Mid-Atlantic States OCS Lease Sale #40" -- Final Environmental Impact Statement, May 1976.

[4]County of Suffolk et al vs. Secretary of the Interior et al. Docket 75C208; The Natural Resources Defense Council, Inc. vs. Secretary of the Interior Docket 76C1229 Eastern District of New York, February 1977. New York State which was involved in the initial injunction of the Lease Sale in August 1976 withdrew the case. The New York counties involved are Suffolk and Nassau. The Department of the Public Advocate filed amicus briefs on behalf of Cape May, Ocean and Atlantic Counties.

[5]County of Suffolk, Nassau et al v. Secretary of the Interior, National Ocean Industries et al, U.S. Court of Appeals, 2nd Circuit, Docket #77-6049, 77-6050, Decided August 25, 1977.

[6]Final Environmental Impact Statement of Lease Sale #42, 1977, at page 668 discusses two routes a potential pipeline could take, with the northern route impacting on Massachusetts, New Hampshire or southern Maine and the southern route impacting southern Massachusetts or Rhode Isand. Criteria used to come up with these pipeline routes were based on bottom criteria of the Georges Bank and potential erosional effects. (Note, because of the relatively small find anticipated, the Department of the Interior has assumed as its first alternative that tankers rather than pipelines will be used to ship oil onshore.)

[7]The seven companies which submitted Notices of Support Activity are Conoco, Exxon, Gulf Energy and Minerals, Mobil Oil, Murphy Oil, Shell Oil and Texaco.

[8]Letter from Gerald M. Hansler, P.E., U.S. Environmental Protection Agency, dated March 3, 1976, to Commissioner David J. Bardin, in response to the DEP "Call for Information". The "Call" was issued to energy companies and others in 1975 and 1976 to solicit information concerning energy facility siting. An analysis of responses was issued in March 1977 by the Office of Coastal Zone Management.

B. Nuclear Power Plants

1. Issues:

Nuclear energy provides New Jersey with about twenty-five percent of its electricity today. This percentage is expected to increase as other proposed nuclear units are completed. New Jersey utilities claim that nuclear power lessens their dependence on foreign oil and contributes to the favorable balance of payments of the United States. They also prefer nuclear power because its generation violates no air pollution standards, in contrast to generating electricity by oil and coal where even a low sulfur content may pose air pollution problems in densely populated areas. Finally, the utilities claim that nuclear power is cheaper for their customers, with the lower fuel and operating costs more than offsetting the higher capital costs of nuclear power plants.

Despite these advantages, many people in New Jersey are concerned about increasing reliance on nuclear energy because of the possibility, although remote, of a catastrophic nuclear accident. The problem of disposing and storing nuclear wastes, which remain radioactive for thousands of years, is also a concern. The potential misuse of certain nuclear materials for making bombs or creating other havoc is also disturbing.

These are not issues, however, over which the State of New Jersey has much control given the U.S. Nuclear Regulatory Commission's preemptive authority in many nuclear matters, including issuance of construction and operating licenses to the utilities.

Indeed, the State has relatively little leverage in nuclear matters, except with respect to some aspects of siting.[1] (Legislation being drafted by the Carter Administration would, if enacted potentially enlarge the state's role, but at this writing this situation is unclear.) And even here, in the absence of comprehensive land use legislation, such as CAFRA, for example, a municipality may have more effective bargaining power than the State, since it is the municipality which must ultimately issue the building permit. Because of the difficulties that utilities have had with obtaining approval for nuclear power generators, one utility, Public Service Electric and Gas Company has proposed building an offshore floating nuclear generating plant to be anchored out in the ocean just within the three-mile limit in the mouth of Little Egg Harbor Inlet adjacent to Brigantine National Wildlife Refuge.

2. Background

New Jersey has two operating nuclear power plants, four units under construction, and two additional proposed units pending state and federal approval (See Table 8 for Existing and Proposed Nuclear Plants for New Jersey).

The state's first nuclear power plant, the Oyster Creek unit, began operating in 1969 and is located in Lacey Township, Ocean County. Its proximity to Barnegat Bay has created problems for

fishing and boating interests because of the thermal waters which are discharged from the plant into Barnegat Bay which have stimulated the growth of destructive wood-boring shipworms. The warmer waters have had the effect of changing migration patterns of fish (particularly the Atlantic menhaden, New Jersey's most important commercial species) which no longer migrates south for the winter.[2]

Table 8
Existing and Proposed Nuclear Plants for New Jersey

Name of Plant and Location	Operation	CAFRA Status	Cooling System
Oyster Creek Lacey Township	1969	Pre-CAFRA	Once-Through Cooling (under review)
Salem #1 Artificial Island	1976	Pre CAFRA	Once-through Cooling
Salem #2 Artificial Island	1979	Pre CAFRA	Once-through Cooling
Hope Creek #1 Artificial Island	1982	CAFRA Conditional approval	Cooling Tower
Hope Creek #2 Artificial Island	1984	CAFRA Conditional approval	Cooling Tower
Forked River Lacey Township	1982	Pre-CAFRA	Cooling Tower
Atantic Generating Station (two units)	1985 1987	CAFRA Application Pending	Once-through Cooling

When the plant closed down, as it did in the winter of 1972, 1973 and 1974 for repairs, the fish, accustomed to the warmer water and unable to adjust, died. A plant shutdown in the summer of 1973 also resulted in a fish kill leading one court to conclude that (as had many biologists previously) sudden change of temperature in the plant discharge rather than any specific temperature was enough to produce a fish kill. The damage produced by shipworms boring away at piers and marinas in the nearby waters has provoked lawsuits against the utility.[3]

Jersey Central Power and Light Company is building a second unit, the Forked River unit, next to the Oyster Creek plant. Although the Forked River plant application was approved by the federal government prior to CAFRA, substantial construction work did not start until recently, which led DEP's Division of Marine Services to call for a CAFRA review. After an appeal by the utility, the Hearing Officer declared in October 1976 that the Forked River unit was exempt from CAFRA review because sufficient on-site construction had taken place prior to the effective date to qualify for exemption status. Therefore, the Forked River unit did not need a CAFRA permit.

Contrary to assertions that people will not live close to nuclear plants because of fears of high radiation levels or an accident, Lacey Township (in which Oyster Creek is located) has experienced a building boom in recent years. This population increase and other factors led the Department of Environmental Protection to establish a moratorium in 1976 on large-scale residential construction within four miles of the plant, until appropriate land uses surrounding nuclear plants and regulatory measures to govern them were more thoroughly explored.

Three possible explanations exist for the building boom in Lacey Township. First, people are not afraid to live in proximity of nuclear plants. Second, the location of Lacey Township in the heart of the New Jersey's resort area has such a strong attraction as to overcome any other locational disadvantage. Third, low local property taxes in Lacey Township due to the utility's gross receipt tax payments, provide an incentive to live in the municipality. (The gross receipts tax is the tax that a utility company pays to municipalities which contain generating plants, switching stations, poles and wires within their boundaries. The tax constitutes 7.5 percent of each consumer's utility bill.) In 1974 Lacey Township received $5,975,374.37 in tax revenues in contrast to $849,050.94 in 1965 - a sevenfold increase, resulting in low property tax payments by residents.[6]

The gross receipts tax has also had its impact on another New Jersey municipality, Lower Alloways Creek, which is intended to accommodate four nuclear reactors.[7] There the gross receipts tax has also kept down the property tax and increased the number of municipal services. To what extent building has taken place in the remote location (far from any popular recreational resort) is as yet unknown since the building moratorium that was imposed on Oyster Creek applies also to Lower Alloways Creek. At present one plant, Salem #1, is operating on Artificial Island, which is really a peninsula built up from dredge spoils by the Army Corps of Engineers earlier this century. Salem #1 began operations in late 1976. Both Salem #1 and Salem #2 were under construction prior to the enactment of CAFRA.

Hope Creek was the first power plant of any sort that was reviewed under CAFRA. It was granted a conditional permit. Conditions ranged from requiring the utility to notify DEP's Bureau of Radiation regarding shipments of radioactive materials, refueling of spent fuel rods, status of storage capacity for spent fuel rods, potential fish mortality resulting from plant shutdowns, to banning the use of mixed uranium/plutonium oxide fuel rods at the Hope Creek facility.

Both the Public Interest Research Group of New Jersey and the Department of the Public Advocate challenged the issuance of the CAFRA permit because of potential risks posed by the passage of LNG tankers past the nuclear facility. These safety questions have not been fully resolved although the Nuclear Regulatory Commission has issued a construction permit for the Hope Creek units.[8] (This is discussed in further detail under the LNG section.)

The second major energy facility permit application under CAFRA was submitted by Public Service Electric and Gas Company on August 20, 1974. The proposal calls for the construction of two floating nuclear reactors, mounted on a barge to be located 2.8 miles offshore northeast of Atlantic City, the so-called Atlantic Generating Station. The concept of an offshore plant was intended by the utility to eliminate some of the problems associated with siting nuclear plants on land. It has, however, produced its own problems concerning, for example, the implications of a potential steam explosion on air and water which might result from a malfunction, such as a core meltdown, of the plant. The N.J. Office of Coastal Zone Management is awaiting the release of the final environmental impact statement and other important analyses on the offshore plant by the Nuclear Regulatory Commission before reviewing this application.

3. Public Health and Safety Factors

This section discusses public health and safety issues relating to nuclear energy production and siting.

a. Nuclear Safety

The greatest concern regarding New Jersey's increasing reliance on nuclear power for electric generation purposes is the possibility that a major reactor failure might occur, particularly a failure in the cooling system. Such an accident could result in the fracturing of the plant structure and the release of long-lived radioactive particles to the environment. The Reactor Safety Study (WASH-1400) performed for the N.R.C. indicated that the likelihood of a reactor accident was smaller than that of many other accidents with similar consequences.[9] Specifically, WASH-1400 found that dam failures, airplane crashes and earthquakes were at least as likely to occur as a major reactor accident and that the harmful effects of such accidents were comparable to, or greater than those of a nuclear plant accident. WASH-1400 has been criticized by others, including the U.S. Environmental Protection Agency, as potentially underestimating the true dangers entailed in nuclear power development.[10] Dr. Glenn Paulson, Assistant Commissioner for Science within the Department of Environmental Protection in a speech before the American Nuclear Society in August 1977 referring to the WASH 1400 study, noted that the science of statistical risk analysis did not deal adequately with the probability of a series of simultaneous failures. The risk analysis did not, for example, anticipate or make allowances for the series of events that led up to the fire at the Tennessee Valley Authority's Browns Ferry reactor. He noted that to reduce some of these uncertainties, New Jersey had petitioned the American Atomic Energy Commission in 1974 -- unsuccessfully as it turned out -- to conduct analyses concerning the consequences of a Class 9 accident which is considered the worst type that could occur and which is because it is considered so unlikely, is sometimes called "incredible".[11]

As a consequence of the remote but nevertheless real possibility of a reactor accident, there is concern regarding the need for control over population densities in the vicinity of nuclear

plants. NRC regulations (10 CFR 100) require that nuclear facilities be located in sparcely populated areas so that protective measures, such as speedy evacuation, can tak place in the event of an accident. A major factor in the 1973 decision of the staff of the then U.S. Atomic Energy Commission to reject Newbold Island in the Delaware River as a site for the Hope Creek nuclear plants now being built at Artificial Island was the high population density in the Philadelphia-Trenton area surrounding Newbold Island. Unfortunately NRC does not review or regulate population growth around nuclear plants once they are built. The tripling of homes with a four mile radius of the Oyster Creek plant from 3162 to 9507 between 1965 and 1976 led the Commissioner of DEP in March 1976 to declare a building moratorium around nuclear plants until the safety aspects of living in close proximity to such plants have been satisfied.[12]

b. Disposition of Spent Fuel

The currently used method of disposing nuclear waste are considered by many to be as great a problem as that relating to the safety of operating a nuclear plant. This is because of the radioactive nature of nuclear wastes, which may take several tens of thousands of years to decay. A short term problem relates to the transportation of the spent fuel to a secure disposal site. The long term problem is to secure a suitable storage site and ensure that none of the poisonous waste will escape into the atmosphere or leach into the groundwater table where it could contaminate a future drinking supply.

The Coastal Area Facility Review Act specifically charges the Commissioner of the Department of Environmental Protection (DEP) to consider the disposal of nuclear wastes from any facility that may be approved to assure that the proposed method for disposal of radioactive waste material to be produced or generated by such facility will be safe, conforms to standards established by the Nuclear Regulatory Commission and will effectively remove danger to life and the environment.[13]

And indeed, in the review of the Hope Creek nuclear generating plant by DEP the Commissioner made formal findings that:

> The proposed method for disposal of radioactive waste material...(i) will be safe insofar as it takes place within the State of New Jersey... (ii) conforms to standards established by the Nuclear Regulatory Commission and (iii) will effectively remove danger to life and the environment from such waste material provided the conditions of the permit are met.[14]

c. Nuclear Theft

Nuclear-powered electric generation may represent a public health and safety concern for New Jersey if plutonium is used in the future as a fuel in the state's light water reactors (LWR). During the fissioning of uranium-235, plutonium-238 is produced as one

by-product of the reaction. Through reprocessing of the used or "spent" fuel, plutonium may be recovered for subsequent use as a primary fuel in LWRs. A concern is that plutonium could be stolen or otherwise illicitly diverted for use in the fabrication of nuclear weapons. In view of the lack of adequate safeguards for the handling of plutonium fuel, the U.S. Nuclear Regulatory Commission decided in 1975 to defer any decision to proceed with plutonium recycling.

4. Environmental Impacts

The major environmental impacts of nuclear plants relate to water consumption and thermal pollution. Nuclear plants require thousands of gallons of water per minute for cooling when once-through cooling systems are used. "Once through" cooling consists of water being taken up through a valve, routed once through the reactor coolong system, and discharged into a receiving body of water. The Oyster Creek plant, for example, uses 640,000 gallons per minute in its "once through" cooling system. The source of the cooling water - whether river, estuary or bay - is one area of concern. This factor may influence the rate of dilution of the heated effluent and salinity values in coastal waters. Also, the manner in which the water is discharged is important. Where the cooling water is discharged directly into a receiving body, such as the ocean, a river or a bay, it may adversely affect marine life because of the rise in temperature -- from 16^{o} to 20^{o}F -- that resulted during its passage through the plant. Mention kills due to absence of heat as well as extra heat.

Oyster Creek, a single reactor unit, is already, after eight years of operation, considered one of the older nuclear plants in the U.S. Newer nuclear plants are often built in units of two. When such plants are designed with "once through" cooling systems, they have the advantage that one unit can continue to function while the other is under repair or shutdown. This can minimize the sudden drop in temperature and shock which resulted in some of the fish kills in Oyster Creek.

Until screens were placed over the intake water valves in nuclear reactors, many marine organisms and fish larvae were sucked into the cooling mechanism by virtue of the force or velocity exerted by the intake system. Efforts have been made to reduce these intake pressures, but marine organisms continue to be entrapped in many plants operating today. This is a disadvantage of once-through cooling and, to a lesser extent, other cooling techniques as well.

Alternatives to "once-through" cooling systems exist in the form of cooling ponds, which require much land, and cooling towers. Towers evaporate the waste heat into the air thus and reduce the thermal impact upon the receiving waters. The proposed Forked River plant to be located next to Oyster Creek is designed with a tower approximately 500 feet high. The two Hope Creek plants on the Delaware will be built with cooling towers, in contrast to the two

"once-through" Salem units. As water is evaporated through cooling towers, condensation (fogging) may occur, which may alter the microclimate surrounding the plant.

In addition, the water that cooling towers take up is not all returned to the receiving channel, but to the atmosphere, and represents an absolute loss to the river or stream system. During droughts, diminished flows could result in adverse effects downstream or salt water intrusion. The Delaware River Basin Commission recently directed two utiities on the Delaware to provide back-up water storage for their nuclear power plants as a safeguard during drought conditions.[10] In addition, when seq water is used for cooling, the deposition of salt from the tower may be harmful to the soil, especially if the fallout is onto agricultural land. From an aesthetic viewpoint, cooling towers produce vapor plumes and local fogs which result from the condensation of warm air leaving the tower and mixing with cooler surrounding air. Such mists are particularly severe during colder months when temperature differentials are at their greatest.

The need for the State to be concerned with protecting its waters from thermal pollution was emphasized by the National Marine Fisheries Service, which, in response to the "Call for Information", recommended:

> ...any energy related facility or project which will chemically, thermally, or radioactively pollute, or require severe habitat alteration, should be excluded from estuaries, bays and near shore ocean waters of New Jersey.[15]

It is unclear to what extent the Nuclear Regulatory Commission would support this strong recommendation, which would effectively bar nuclear and other facilities requiring "once through" cooling from the state. Resolution of this problem by the relevant federal agencies will be one factor to be worked out in the coastal planning process.

5. Siting Factors

In New Jersey, historically the initial decision to site an electric generating facility, conventional or nuclear has been made by the utilities. The new state legislation creating a Department of Energy and proposed new federal siting legislation might alter this pattern in the future.

Because of difficulties that utilities have encountered in obtaining site approvals, new approaches to siting energy facilities have been sought. One strategy favors clustering, where siting approval is required only once for several units. In this way, economies of scale can be achieved, for the acquisition of buffer areas and the adoption of elaborate security systems, for example. While clustering may have certain advantages in the case of small scale installations,[16] clustering of nuclear plants may pose enormous stresses on the land and water environment.

The proposal to build a plant 2.8 miles offshore, off Atlantic City, represents an extreme approach to siting and is an indicator of the frustration that utilities have experienced in siting nuclear plants on land. The offshore plant is intended to solve the problem of finding both a location remote from population centers and a reliable cooling source. The potential escape of radioactivity, in the event of an accident, into the ocean or the air above and uncertainty as to the behavior of the radioactivity has given rise, however, to intensive local opposition by the counties located closest to the plant. In addition, N.J. DEP has vigorously expressed concern about a steam explosion and the effects of steam condensate escaping into the air and "falling out" over land.

The opposition raised by the offshore power plant has, in fact, turned out to be as intense as any that has been raised against land-based plants. One reason is the not inconsiderable burden of setting a precedent not only nation, but worldwide.

Approval is not likely to come soon. In addition to the permits which must be obtained from the U.S. Nuclear Regulatory Commission, the Public Service Electric and Gas Company needs to obtain special permission to build the plant in state waters beyond the pierhead line. New Jersey's riparian statutes do not authorize the Natural Resource Council in DEP to lease or grant lands seaward of the bulkhead and pierhead line along the Atlantic coast. Under current state law, this would require an act of the legislature.

6. Conclusion

Today, five nuclear generating plants (Oyster Creek, Salem 1 and 2, Hope Creek 1 and 2) are in operation or have been approved in New Jersey. This is one-twelfth of all nuclear plants in the country, not an insignificant number in view of New Jersey's high population density, and does not include the Forked River or Atlantic generating plants. Even with this comparatively large number of plants and energy conservation measures, it has been said by some utilities that additional nuclear plants are needed to meet New Jersey's future needs. Whether this is indeed so, will, it is hoped, emerge from both the Master Plan which the new Department of Energy is preparing and the hearings being held by the Public Utility Board on New Jersey's future energy needs.

Footnotes

[1]Federal and state criteria call for nuclear plants to be located in low density population areas to facilitate evacuation that might be necessitated by a nuclear accident. Federal Regulations (10 CFR 100) requires that a utility designate an exclusion area zone in which no building may take place. This area is usually owned by the utility. Surrounding the exclusion zone the utility must identify the low population zone (LPZ) of sufficient size to facilitate the evacuation of the population within these boundaries. Beyond this, the utility should identify population center distances which is the distance between the reactor and the nearest boundary of a community with 25,000 residents. Although a utility must be in control of activities within the exclusion area, it need not have control, under federal regulations, over activity occurring in the other two outer zones. In March 1976 the Commissioner of the Department of Environmental Protection imposed a building moratorium, under CAFRA, of 4.0 miles and 6.4 miles around Oyster Creek and Artificial Island respectively, pending a study of appropriate land uses surrounding nuclear plants in New Jersey's Coastal Area. This was deemed necessary to check uncontrolled growth that seemed to be taking place around Oyster Creek. (The difference in the mileage figures relates to the size differences of the plants.) See DEP News Release and testimony of Commissioner David J. Bardin before the Committee on Energy and Environment, New Jersey Senate, March 10, 1976.

[2]Migration is induced when temperature of the water falls below 59°F. 87°F represents an upper limit of tolerance. For more see: Appendix B to "Full Term Operating License Environmental Technical Specifications for Oyster Creek Nuclear Generating Station", Docket #50-219, Ocean County, New Jersey, New Jersey Central Power and Light Company, June 28, 1976. See also Richard Kantor, Estuarine and Wetland Resources, A Staff Working Paper, N.J. Department of Environmental Protection, Office of Coastal Zone Management (January 1977), p. 71 and U.S. Environmental Protection Agency, Fish Kills Caused by Pollution in 1973, U.S. Government Printing Office, Washington, D.C. (p.21).

[3]N.J. Supreme Court in New Jersey vs. Jersey Central Power and Light Company, 69 N.J. 102 (1976).

[4]In the Matter of Jersey Central Power and Light Company v. N.J. Department of Environmental Protection, Docket #DEP ER76-203, October 26, 1976. Appealed to Superior Court, Appellate Division, DK. #A-1789-76.

[5]See Supra Note 1.

[6]Meier, Peter, M. and David Morell, Issues in Clustered Nuclear Siting, Brookhaven National Laboratory, September 1976, p. 260.

[7]Hope Creek Opinion #20, September 3, 1976, contained twenty-two decisions.

[8]Nuclear Regulatory Commission, Safety Evaluation Report, Supplement #5, Hope Creek 50-354, March, 1974. The Department of the Public Advocate filed exceptions to the decision by the Atomic Safety and Licensing Board of the N.R.C. See New York Times (New Jersey edition) April 8, 1977, p. B2.

[9]U.S. Nuclear Regulatory Commission, Reactor Safety Study an Assessment of Accident Risks in U.S. Commercial Power Plants (Executive Summary), October, 1975.

[10]For a critique of the Rasmussen study, see U.S. Environmental Protection Agency, Reactor Safety Study (WASH 1400): A Review of the Final Report, EPA-520/3-76-009, June 1976. This study found forty-five deficiencies in the Rasmussen study. Most of these deficiencies related to the possible failures in the equipment. A more significant deficiency related to an inadequate comparison by Rasmussen of the risks between nuclear and other means of electrical power generation.

[11]Glenn Paulson, "Nuclear Power Plants: The Potential Role of Non-Federal Government Agencies or Does the NRC Really Control Everything?" in a speech before the American Nuclear Society in Idaho, August 1977.

[12]Ibid. Note also Testimony of David J. Bardin, Commissioner, N.J. Department of Environmental Protection before the Committee on Energy and Environment, N.J. Senate, Toms River, N.J., March 10, 1976.

[13]Coastal Area Facility Review Act, N.J.S.A. 13:19-11.

[14]Hope Creek Opinion, supra note 7, paragraph #142(h) p. 44.

[15]Letter by William G. Gordon, National Marine Fisheries Service, to David N. Kinsey, February 25, 1976, responding to DEP's Call for Information.

[16]See P. Meier and D. Morrell, Issues in Clustered Nuclear Siting: A Comparison of a Hypothetical Energy Center in New Jersey with Dispersed Siting, BNL 50561, Brookhaven National Laboratory, 1976.

C. Liquefied Natural Gas

1. Issue

As a result of many factors, domestic supplies of natural gas, have been curtailed to New Jersey utilities. Some of these utilities are now seeking alternative sources of the fuel abroad. For efficiency, transportation over the ocean for long distances requires natural gas to be liquefied in transit and revaporized at the port of destination. Shipment of liquefied natural gas (LNG) through heavily travelled state waters and through population corridors and its transfer to reprocessing plants are of state concern because of the catastrophic effects that an accidental spilling of the highly volatile gas could have on life, property and the environment.

2. Background

LNG is natural gas which has been cooled and compressed so that it can be more easily transported or stored. New Jersey gas utilities store domestic LNG at relatively small several facilities throughout the state (including Burlington, Carlstadt, Elizabethtown, Hackettstown, Hamilton, Howell and Stafford Townships) to supplement their regular supplies of natural gas during periods of peak demand. Regulations covering the installation, safety and maintenance of LNG tanks and facilities are contained in regulations issued by the New Jersey Department of Labor and Industry, pursuant to the Occupational Safety and Health Act.[1]

Public Service Electric and Gas (PSE&G) has taken over ownership of a large LNG facility, not yet in operation, in Rossville, Staten Island on the Arthur Kill waterway in New York. The facility faces the New Jersey towns of Perth Amboy, Woodbridge and Carteret which contain two refineries, numerous tank farms, and PSE&G's own conventional generating plant in Sewaren. Middlesex County, which testified on this terminal in 1974, opposed its location because of the proximity of the terminal to the inherently dangerous and explosive industrial facilities and to the large population living nearby.[2] To become operational, PSE&G needs a firm contract from its Algerian partner as well as a license from the Federal Power Commission to import this gas. Gas from this facility would presumably be pipelined to PSE&G's customers in New Jersey.

Both the Tenneco Company and the Transcontinental Pipeline Company (Transco) have previously applied to DEP for riparian, wetlands, air and water permits to construct LNG facilities along the Delaware River in Deptford and Logan Townships in Gloucester County. No action has been taken on these permits pending a decision by the Federal Power Commission (FPC). In December 1976, FPC staff issued a draft environmental impact statement on the Tenneco application, recommending that the project not be built because of safety hazards.[3] At the same time the staff issued an amendment to the final environmental impact statement on the Transco project recommending that that project likewise be withdrawn on the basis of its latest safety analysis.[4]

Although the FPC has not yet acted on its staff's recommendations, it appears as if both projects are moot, since Tenneco has announced that it will be building a terminal in Canada and Transco has announced the withdrawal of its application. It now remains for the FPC to act on PSE&G's application in Staten Island.

Boston is the only city on the East Coast which is currently importing LNG through its harbor. (Construction of two LNG terminals in Cove Point, Maryland and Savannah, Georgia are scheduled for completion in 1978. To avoid accidental collisions, the U.S. Coast Guard, responsible for the safety of shipping in navigable waters, clears shipping lanes for the LNG tankers in Boston Harbor.[5] LNG shipments to the Distrigas facility in Boston occur about once every twenty days. The U.S. Coast Guard escorts the LNG tankers to the Distrigas facility two miles upstream. The Tenneco and Transco applications would have involved 406 annual shipments (an average of more than one per day) and might have resulted in considerable disruption to existing shipping traffic. The FPC's recent decision to allow Distrigas in Massachusetts to increase its LNG imports has buoyed the people in Staten Island, New York, who are opposed to PSE&G obtaining an import license for its Staten Island LNG terminal. The community believes that increased supplies of LNG to Massachusetts may find their way to the New York area by pipeline, obviating the need for a new New York area terminal.[6]

The next section discusses some of the environmental impacts associated with LNG shipments.

3. Safety

Transshipment of LNG involves liquefying the gas in the exporting country, shipping it in specially built low-temperature (cryogenic) tankers, and then regasifying it upon entry into the importing country.

The nature of supercooled LNG is such that upon accidental release, the gas evaporates and greatly expands in volume. It is during the period of evaporation, when the highly concentrated gas forms a neutrally buoyant cloud over the water, spreading as a plume, that the danger of an accident is greatest. An ignition of the dispersing vapor plume could set off a fire several miles downwind of the source and create a hazard to life and property anywhere in the path of the plume.

The shipment of LNG represents a moving hazard since there is always the possibility of a collision with another vessel and a subsequent spill. The potential for such accidents is increased in estuaries, harbors and heavy shipping lanes, especially in population corridors.

The Department of the Public Advocate has challenged DEP's issuance of a CAFRA permit and the Nuclear Regulatory Commission's (NRC) issuance of a construction permit to build the twin Hope Creek reactors on Artificial Island in Lower Alloway Creek because of the possible catastrophic effects that a LNG tanker spill accident could produce in the vicinity of the nuclear cluster. Not-

withstanding the ruling by the NRC's Atomic Safety and Licensing Board that the probability of a cloud of gas igniting over the plant was minimal and that construction should proceed, the Public Advocate has appealed that decision to the NRC's Atomic Licensing and Appeal Board. That Appeal Board remanded the issue back to the Safety and Licensing Board to further address the safety issue. A decision is expected by December 1978.

An FPC analysis of tanker accidents in the Delaware River revealed that accidents were about 30 percent higher than the average casualty rate of other major U.S. ports.[8] Dangerous areas of the river include the junction of the Chesapeake and Delaware Canal and the Marcus Hook and the Paulsboro area (See Figure 6). The frequency with which tanker accidents occur was demonstrated only too vividly in December 1976 and January 1977 when the Delaware River was the scene of a number of tanker accidents, following shortly after the grounding and rupture of the Argo Merchant tanker off Nantucket.[9]

The Delaware River does not, unfortunately, presently have a vessel traffic separation (VTS) scheme; such a radar-operated system monitors and directs shipping traffic much like air traffic is controlled at airports. While the U.S. Coast Guard (which would operate a VTS system) recognizes the need for it in the Delaware River, it is expensive and is only being introduced slowly in U.S. ports.

(a) Buffer Zones

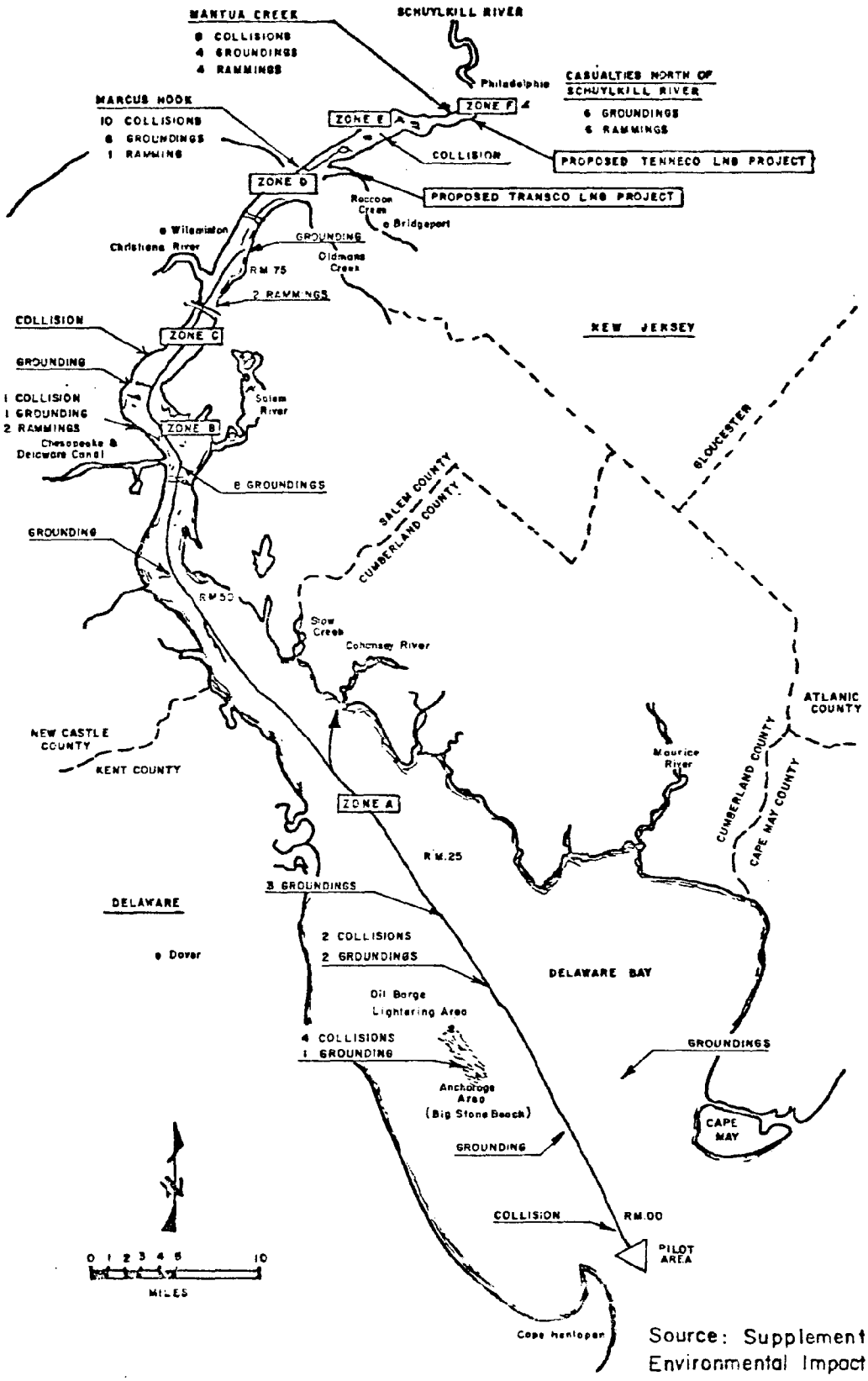
Any buffer zone for LNG facilities should have two elements: the conventional (fixed) buffer around the facility itself and the (temporary) buffer on either side of the shipping channel. Accidents at the fixed LNG facility constitute a lesser hazard, according to the FPC, than an accident occurring in transit which could affect a potentially larger number of people.

In 1974, Governor Byrne's Cabinet Energy Committee established an LNG Task Force to study hazards and set siting criteria for LNG facilities, including their buffer zones. The Task Force discovered considerable disagreement concerning appropriate buffer zones. Because of this uncertainty and because of Federal preemption and federal interest in LNG faciities, the States of New Jersey, Pennsylvania, New York and Delaware petitioned the FPC in May 1976 to issue uniform standards for siting and operating LNG facilities.[10]

Opinions differ on the size of needed buffer zones.

Experiments by the Massachusetts Institute of Technology indicated that a flammable vapor cloud of LNG could spread as far away as 55 to 60 miles from the spill site. Exxon indicated a risk area of up to 20 miles for a 125,000 cubic meter spill. The U.S. Bureau of Mines indicated a combustion distance in excess of 40 miles.[11]

Figure 7
Location of Tanker Casualties
on the Delaware River
(1969 - 1974)



Source: Supplement to the Final
Environmental Impact Statement
For the Construction and Operation of
an LNG Import Terminal at Roccoon Island
Federal Power Commision, December, 1976

An LNG facility located on the lower Delaware River, according to these assumptions, would include a risk zone of at least twenty miles and encompass Cumberland and Cape May counties in New Jersey as well as parts of Pennsylvania and Delaware. A forty mile risk corridor would include the same counties plus, Atlantic, Camden, Gloucester and Salem counties and Philadelphia and Wilmington. In 1975, the FPC calculated that a 125,000 cubic meter spill (contents of a total tanker) would produce a vapor cloud with a 3.73 mile radius and extend for 7.46 miles.[12] In 1976, it revised this estimate by reducing the maximum spill probability to one fifth, or 25,000 cubic meters, the capacity of one of the five LNG cargo tanks, the maximum quantity expected to be ruptured during an accident.[13] Using this assumption, plus stable atmospheric conditions and a wind speed of five miles per hour, the radius of a potential vapor cloud was estimated at 2,510 feet, extending 3937 feet, with a dispersion time of 4.5 minutes.[14]

While the risk corridor (corresponding to the size of the vapor cloud) is estimated by the FPC to be smaller than that calculated by MIT, Exxon, or the U.S. Bureau of Mines, it is large enough to pose significant risks to the population living on either side of the Delaware River. As such, the decision whether to permit LNG tankers up the river is one that the three states abutting the river, namely, New Jersey, Delaware and Pennsylvania should be involved in.

Experiments on the size and potential impacts of an LNG vapor cloud are continuing. For example, since shipment by tanker constitutes the greatest danger surrounding LNG, scientists are considering the solidification of natural gas in transit. This technology is not proven, however, and must be viewed as a long term alternative.[15]

(b) Risks

The Federal Power Commission calculated the probable fatalities resulting from a vapor cloud (mobile-type) accident and from a pool radiation (fixed-site) fire in West Deptford and Logan Township in Gloucester County and found them to be unacceptable.[16] Probabilities were based on:

a) probability of an accident (collision) along the designated route,
b) probability of a spill, given (a),
c) probability of ignition of vapor cloud given (a) and (b),
d) probability of a radiation fire (from fixed site) given (a) and (b) above,
e) probability of fatalities within the estimated risk corridor.

The FPC projects 750 fatalities, with a probability of 9.2 x 106 (or 92 per ten million trips) per exposed person per year, for a vapor cloud fire (This is comparable to being struck by a meteorite or being involved in a nuclear accident.)[17] The FPC attributed 185 fatalities, with a probability of 9.5 x 105 (or 95 per one million trips) per exposed person per year, to a pool radiation accident, that is an accident which would occur at a fixed site.

(This is comparable to poisonings or drownings.) The projection of fatalities for vapor cloud accidents was greater, though with a lesser probability of occurrence than projections for radiation fires.

4. Environmental Impacts

Because of the large buffer zone that should be established, few sites in New Jersey lend themselves to LNG facilities. The LNG facilities proposed on the upper Delaware River in West Deptford and Logan Township would pose a constant danger to the large population and nearby industrial facilities. Downstream, hazards to the population would be less, but adverse impacts on the estuarine environment would be considerable.

The lower Delaware River and estuary are the site of valuable saltwater marshes, wetlands and oyster beds which would be affected by the construction of LNG facilities. Construction at Bayside in Greenwich Township, which has been mentioned as an alternate site for LNG operations, would entail 13-18 million cubic yards of dredging.[18] In addition, periodic maintenance dredging would be required as large tankers require adequate channel depths. Re-gasification of LNG would also entail the use of large quantities of water, which, upon discharge, would be considerably colder than the surrounding water because of the nature of processing the super-cooled liquid gas.[19] The effects of having unnaturally cold water in one part of the river and unnaturally warm water emanating from the nuclear units at Artificial Island might wreak havoc with the marine flora and fauna. These potential effects have not been addressed to date.

5. LNG Siting -- A Regional Approach

The nature of an LNG spill is such that its impact could extend over many miles. An LNG facility built on either side of the Delaware River would, of necessity, have to include the three bordering states in any contingency planning. The Staten Island facility would likewise necessitate an interstate arrangement between New Jersey and New York. Therefore, LNG siting becomes a matter of regional concern which should be addressed by the region.

A regional facility serving the customers of several gas utilities could end up being much larger than contemplated by any one of the utility applicants individually. This might be an advantage or disadvantage. Economies of scale might make it advantageous for a reprocessing plant to be of a large enough size to reprocess the LNG of several utilities. A single unit would call for the utilities to share dock and storage space and possibly involve some institutional changes in doing business. The disadvantage is that an accident at a large concentrated facility might be worse than one at a smaller facility.

A regional approach to siting has the advantage of providing a large number of sites from which to make a selection and would result in enhanced safety and reduced risk. The FPC identified several alternate sites along the Delaware River and Chesapeake

Bay.[20] It found none of them satisfactory, with the exception of Cove Point, Maryland, which has already been licensed by the FPC for an LNG facility to serve the needs of the Columbia Gas Company. Staff to the FPC indicated that if the West Deptford and Logan Township sites were rejected by the FPC, expansion of the Cove Point facility should be explored as an alternative.[21]

One alternative to an LNG facility plant on the shoreline would be a deepwater port linked to the shore by a pipeline for an inland processing plant. This would eliminate the dangers to the people living along the Delaware River. The implications of deepwater ports in general are discussed in Section D.

6. State Options

The State has several alternatives with respect to siting LNG facilities:

a) It could ban LNG facilities entirely.

b) It could ban LNG until development of the Outer Continental shelf in the Baltimore Canyon indicates that there is no gas there in commercial quantities. (If gas were found offshore, the need for LNG would be considerably reduced. Gas projections for Lease Sale 40 range from 104 billion cubic feet (bcf) to 512 bcf per year for a field life of about 25 years. This represents between 30 and 193 percent of New Jersey's 265.9 bcf gas consumption in 1976. While offshore gas would not necessarily be dedicated to New Jersey, the likelihood of some of it going to the mid and New Atlantic region in the event of a strike, is good.[22]

c) It could sanction limited LNG shipments until OCS development starts and reveals extensive gas finds.

d) It could sanction deepwater ports for LNG linked to the shore by pipeline. This would eliminate LNG tankers in the inland waters of the state and their potential for accidental collisions and spills of LNG. A recent study examined the feasibility of building a LNG terminal off the coast of Los Angeles.[23]

e) It could permit LNG terminals along the Lower Delaware River, sacrificing a portion of the wetlands.

f) It could permit LNG facilities at the proposed locations based on the remote statistical probability of such accidents occuring.

Decisions among these and other options involve scientific analysis and value judgements and must be made in consultation with other federal, state and local units of government as well as interested and informed segments of the public.

7. Conclusion

The Federal Power Commission holds the most important key to LNG because it both regulates the prices of interstate gas and issues the permits to import LNG. Deregulation of the price of gas could conceivably create the needed incentives for producers to increase natural gas production for interstate commerce and lessen the need to import it. Importation of LNG, on the other hand, would create a dependency on gas similar to that which the nation developed for petroleum. A build-up of this type of dependency is contrary to the goal of reducing U.S. vulnerability to foreign embargoes.

Given LNG's shipping hazards and the alternative of conservation, a more prudent course would appear to be a public education program to conserve gas. In any event, since LNG siting issues involve several states, LNG should be treated as a regional matter with decisions concerning siting and the use and distribution of LNG to be decided by the affected states.

Footnotes

[1]Occupational Safety and Health Act, P.L. 1973, N.J.S.A. 34:6A, Regulations withdrawn NJAC 12:110-179, 1975, NJAC 12:180-205 in effect.

[2]Middlesex County Planning Board testimony before the Advisory Council on Environmental Protection on Liquid Natural Gas Facilities of the Distrigas Company, September 13, 1974.

[3]See Federal Power Commission, Bureau of Natural Gas, Draft Environmental Impact Statement, "West Deptford LNG Project", Docket #CP76-16, December 1976, p. 158.

[4]See "Supplement to Final Environmental Impact Statement for the Construction and Operation of LNG Import Terminal at Raccoon Island", December 1976, Docket CP73-258, 259 and Docket CP267-270, incl.

[5]In Boston, the U.S. Coast Guard requires 72 hours notice (by telex) of the arrival of an LNG tanker. It in turn provides 24 hours notice to pilots and towing boats in the harbor that no shipping will be allowed during transit of the LNG tanker. Before a LNG tanker is permitted to proceed into the harbor, it is boarded by U.S. Coast Guard personnel for inspection.

[6]Robert E. Huber, "LNG Foes Glad to See Massachusetts Gas OKd", Staten Island Advance, April 18, 1977.

[7]Jansen, Donald, "Effort Made to Bar Atomic Power Plant", New York Times, April 8, 1977.

[8]See Draft Environmental Impact Statement (DEIS) West Deptford, Supra note 3, page 110.

[9]The Olympic Games tanker spilled 134,000 gallons of oil into the Delaware River near Marcus Hook on December 27, 1976. The Argo Merchant spilled 7.5 million gallons offshore Nantucket.

[10]Petition for rule making in the matter of the need for site selection and facility operation criteria for liquified natural gas terminals. The Petition dated May 6, 1976 (Docket RM 76-13) to the Federal Power Commission was submitted by the Attorney Generals for New Jersey, New York and Pennsylvania; the Township of Woodbridge; Congressman John M. Murphy, from New York; and the New Jersey Public Advocate. It was printed in the Federal Register June 4, 1976.

[11]Memorandum from R. Katz to R. Dyba, entitled "LNG Siting Group", July 17, 1975.

[12]Federal Power Commission, Attachment #5, to the Final Environmental Impact Statement for the, "Construction and Operation of an LNG Import Terminal at Staten Island, New York", July 15, 1975, p. 2.

[13]See DEIS West Deptford, Supra note 3, introductory note.

[14]Ibid, p. 107. Note a higher windspeed would facilitate dispersion of the methane gas and reduce the time-length of the fire; conversely a calmer wind would lengthen the time and extent of the fire.

[15]William P. Strumbos has done considerable work in this field. See U.S. Patent 3,834,174, "Cryogenic Transportation Method and Apparatus Therefore", September 10, 1974 and V.U. Minorsky and George G. Sharp, Inc., "LNG Vessels Regulatory and Economic Consideration", before the Gulf Section of the Society of Naval Architects and Marine Engineers, February 11, 1972.

Note also experiments by U.S. Coast Guard on the behavior of LNG flames, Coastal Zone Management Newsletter, October 20, 1976., p. 6.

[16]See Supplement to Final Environmental Impact Statement, Raccoon Island, supra note 3.

[17]Determinations of the acceptable levels of risks to society were made by the Rasmussen study group in assessing nuclear risks. The group identified several classes of accidents:

a) probability of 1 accident in 1,000 (1:1000) or 10^3
b) probability of 1 accident in 10,000 (1:10,000) or 10^4
c) probability of 1 accident in 100,000 (1:100,000) or 10^5
d) probability of 1 accident in 1,000,000 (1:1,000,000) or 10^6

Type (a) accident, associated with industrial occupational hazards and some sport events, was viewed as societally unacceptable.

Type (b) and (c) accidents, associated with drownings, poisonings and fires, were acceptable to varying degrees, and

Type (d) accident was viewed as negligible and associated with meteorites and nuclear accidents.

See U.S. Nuclear Regulatory Commission: "Reactor Safety Study: An Assessment of Accident Risks in U.S." Wash 1400 (NUREG 75/0114) p. 11.

[18]DEIS, West Deptford, supra note 3, Table 28, page 151.

[19]Ibid, page 80.

[20]Ibid, page 132. Aside from the West Deptford and Logan Township (Raccoon Island) sites, FPC identified two additional sites along the Delaware River; namely, Bayside in New Jersey, and Cherry Island near Wilmington, Delaware, Stillpond Neck, Baltimore Harbor, Sotterly Point, Scarborough Neck and Cove Point, Maryland were other sites identified along Chesapeake Bay.

[21] Ibid, page 157.

[22] Telephone communication with Alan Day, Outer Continental Shelf Office, Bureau of Land Management, Nw York City, September 22 1976. Note that the Final Environmental Impact Statement for Lease Sale 42 indicates the likelihood that the bulk of any natural gas produced would be consumed either in New England or the Mid-Altantic, "since shipping the gas against the strong geographical price gradient appears unlikely". p. 1001.

[23] See Fairchild Stratos Division, Offshore LNG Receiving Terminal Project. Prepared for Western LNG Terminal Company, Los Angeles, California, March 1977. See also H.W. Backhaus, "Offshore LNG Handling System aimed at Severe Conditions", Oil and Gas Journal, September 26, 1977, p. 60.

D. Deepwater Ports

1. Background

Deepwater ports are floating or fixed structures for transfer of oil and gas that are located in open waters outside coastal ports and harbors. They represent siting alternatives for shoreside marine terminals. They were conceived to accommodate large tankers unable to negotiate the narrow channel depths characteristic of so many of the waterways in the United States and to avoid the otherwise necessary dredging and maintenance of these relatively shallow channels. The United States Department of Transportation has approved the building of two ports in Louisiana and Texas.[1] Both the high cost of constructing such ports and the need for special legislation to permit deepwater port construction in New Jersey waters beyond the pierhead line make it unlikely that they will be built in the near future. Deepwater ports should not however, be ruled out entirely, due to the development of Outer Continental Shelf hydrocarbon resources, possible LNG operations and the increased shipping traffic and spills that these two energy technologies might generate. Indeed, the recent tanker spills on the Delaware River revived the issue of a deepwater port in Delaware Bay and even caused people previously opposed to the concept to reconsider the matter.

The Delaware River and New York Harbor have the deepest channel depths in New Jersey, both with 40 feet depths. Both ports can accommodate tankers up to 70,000 deadweight tons (dwt), but are unable to handle the very large crude carriers, known as "VLCCs" which can accommodate upwards of 250,000 dwt. in vessel depths exeeding 80 feet. The larger tankers are preferred by industry because they generate economies of scale. However, not all channels in New York Harbor are maintained at 40 feet. Tankers destined to serve refineries along the Arthur Kill must first lighter or transfer some of their cargo to smaller ships or barges, in the main channel. A deepwater port linked to the shore by a pipeline would eliminate the need for such lightering and result in greater efficiency. More importantly, it could reduce the amount of oil spilled during each transfer operation.

Economics, however, dictate that a deepwater port be of sufficient size to justify its costs and that the throughput of hydrocarbons in the port be sufficient to supply the refineries on shore.[2]

2. New Jersey as a Deepwater Port Site

Potential sites for deepwater port development off the coast of northern New Jersey and in Delaware Bay have been identified in several studies of deepwater ports. The New Jersey offshore region has been identified because of the large demand for petroleum products in the Mid-Atlantic region, and the existing concentration of refineries in the New York Port and Delaware River areas.[3] Six specific reasons for considering New Jersey a likely site for deepwater ports were identified in a 1974 study by Arthur D. Little, Inc.:-

1) pipeline investments for a Mid-Atlantic terminal are less than the investment required for other alternatives,

2) there is an existing base of refinery infrastructure in the Mid-Atlantic,

3) The Mid-Atlantic region (including New York State) is the largest petroleum product demand region in the United States,

4) Mid-Atlantic refinery capacity in 1970 was 35-40% of Mid-Atlantic demand (including New York) and 25% of Petroleum Allocation District I demand [That is, the Mid-Atlantic region could sustain additional refinery capacity],

5) a deepwater terminal for direct receipt of VLCC's would allow transportation cost savings to refiners over transshipment from the Caribbean or Canadian Maritimes,

6) Mid-Atlantic refineries have a transportation cost advantage over Gulf Coast refineries in supplying upper East Coast markets.

3. Potential Impacts

This section describes some of the onshore impacts that have been predicted to result from a deepwater port.

(a) Environmental - Pipeline versus Tanker Line to Shore

The decision to link a deepwater port to land by tanker or pipeline is a crucial one. While pipelines are preferable from the point of view of reducing spillage in transfer operations, their use might be limited in New Jersey because of a lack of appropriate landfalls, as outlined in the discussion on OCS facilities. The location of a pipeline landfall could be the determining factor in locating a deepwater port, since with pipeline costs being so high, economics will favor the shortest and most direct route between two points.

Both the Sandy Hook area and Delaware Bay would be desirable deepwater port sites since they are close to existing refineries and processing industries. Great care would, however, be needed in siting potential terminals in these areas, because of the heavily used shipping lanes.

(b) Socio-economic

Whether measured by the number of persons employed or increased levels of air and water pollution, the impacts of deepwater facilities construction are potentially significant. Direct environmental impacts would result from routine and accidental offshore oil spills and onshore refinery and storage facilities. Of potentially greater importance are the environmental and socio-economic impacts from petrochemical and other forms of industrial development that might

result if a deepwater port significantly increased total crude oil deliveries to the region rather than just replacing deliveries from smaller tankers.

For example, in examining the possible effects on Cumberland and Cape May counties of deepwater port construction, Arthur D. Little estimated that 14 square miles of land would be needed in the counties to build "at least 9 new refineries and 13 new petrochemical plants".[4] Such land would, of course, preempt valuable wetlands, farmland and result in a significant change in lifestyles and the social economy of the area.

6. Siting Factors

The size of an offshore terminal and the purpose for which it is intended are factors that should be weighed in decision-making concerning deepwater ports. An offshore terminal to handle LNG might, for example, be preferable to tankering LNG up inland waterways. Middlesex County, while opposed to deepwater ports on a generic basis, has favored a deepwater port to handle LNG for safety reasons.[5] Equally, a small port tailored to New Jersey and the immediate region might be an acceptable alternative to a larger port serving the total East Coast's petroleum and gas needs. A large port might produce extensive onshore and offshore activities and alter the character of the region. Offshore tanker and transfer activity could result in chronic oil discharges and in the gradual deterioration of the state's ocean waters.

The possible adverse synergistic impact produced by a petroleum-LNG accident would seem to rule out a port to handle both LNG and petroleum, and favor one (or more) smaller port(s) for each community.

7. Legal Implications

As with other energy technologies discussed, offshore terminals are the subject of Federal concern and preemption. The federal Deepwater Port Act of 1974 gives an adjacent state certain prerogatives with respect to approving the siting of deepwater ports outside of its territorial waters. These prerogatives extend only fifteen miles seaward of the state.[6] It is likely that a spill occurring 20 to 30 miles offshore might affect the adjacent states directly or indirectly. Beyond cleanup, however, an adjacent state's power to recover damages from a spill are limited.[7]

Special legislation would be needed to build a deepwater port in New Jersey territorial waters, since, as with floating nuclear plants, the Natural Resources Council lacks authority to convey grants to riparian lands for any purpose beyond the pierhead line.

Opposition to a deepwater port has been pronounced in New Jersey, as demonstrated by a number of bills opposing deepwater ports.[8] Opposition has been based on a fear of oil spills associated with deepwater ports. While these cannot be ruled out, there are a number of stipulations that the State could attach

to any offshore terminal such as limiting the size of the tanker permitted to berth at the port. This might reduce the possibility of spilled oil actually reaching the shore and might be preferable to increasing the probability of spills and accidents on the state's waterways.

8. Conclusions

Much more information on the economics, risks, and environmental costs and benefits concerning offshore terminals is needed. They do, however, provide alternatives to the movement of LNG tankers in inland waters, should LNG imports be permitted. In the event that extensive petroleum or gas deposits are found in the Baltimore Canyon, offshore terminals could provide a means of diverting hydrocarbons not intended to be refined, processed or used in the state or region to other destinations on the east coast, without these resources having to touch New Jersey's mainland. In this way, they would reduce the adverse onshore environmental impacts and emissions associated with storage tanks and booster stations and make this land available for other uses.

Footnotes

[1]United States Congress, Office of Technology Assessment, Coastal Effects of Offshore Energy Systems, November 1976, p. 184. The Texas (Seadock) terminal is proposed for 26 miles off Freeport; capital costs are estimated at $659 million. The Louisiana (LOOP) terminal is planned for 19 miles off the coast and is estimated to cost $348 million for the early phase and $800 million for the expanded version.

[2]Ibid, p. 186, Figure IV-38 anticipates the volume of imported oil in the Atlantic Region (New Jersey, Delaware, New York and Pennsylvania) to be of the order of 1.5 mbd in 1980 and 2.0 mbd in 1985.

[3]U.S. Army Corps of Engineers, US Deepwater Port Study, by Robert R. Nathan Associates, October 30, 1972 (for the Institute of Water Resources, US Department of the Army, Corps of Engineers); U.S. Army Corps of Engineers, Philadelphia District, Atlantic Coast Deepwater Port Facilities Study, Arthur D. Little, Inc. Potential Onshore Effects of Deepwater Oil Terminal-Related Industrial Development, Vol. I through IV. A Report to the Council on Environmental Quality, 1974.

[4]Arthur D. Little, Inc., 1974 Report, Supra note 1, p. 179.

[5]The Middlesex County Planning Board passed a Resolution January 11, 1973 opposing deepwater ports. However, in its statement on "Liquid Natural Gas Facilities of the Distrigas Company" before the Public Forum Conducted by the Advisory Council on Environmental Protection, September 13, 1974 it favored an offshore port for LNG.

[6]The Deepwater Port Act sets up a Deepwater Port Liability Fund (33 USC 1517). This is a no fault fund for clean up and is in the amount of $100 million to be raised by charging a 2 cent per barrel loading tax.

[7]Deepwater Port Act of 1974, 33 USC 1501 et seq. "Adjacent" states are defined as those which would be directly connected by pipeline to a deepwater port or located within 15 miles of a deepwater port (Section 1508). Licenses for deepwater ports will not be issued by Secretary of Transportation without the approval of the Governor in adjacent states. Licenses are to be consistent with state coastal management programs, or be conditioned on such consistency. This consistency clause stands separately from the federal consistency clause of the Coastal Zone Management Act of 1972 and may be invoked prior to completion of a state's management program.

[8]Senate Bill 22 was introduced on January 13, 1976 and referred to the Committee on Energy, Agriculture and the Environment Assembly Bill 350 was introduced January 13, 1976 and referred to the Committee on Transportation and Communications.

V. STATE AND FEDERAL ROLE IN ENERGY FACILITY SITING

This chapter describes the involvement of the state and federal government in energy facility siting in New Jersey's Coastal Zone. Local government perspectives on proposed energy facilities are provided in the next section.

A. State Role

1. Legislation

The Coastal Area Facility Review Act (CAFRA) provides DEP with the specific authority to regulate the siting of specified, major energy facilities in a defined coastal area. A CAFRA permit is required before any major energy facility can be constructed in the State's coastal area, including electric power generation plants; petroleum refineries; storage, handling, and transfer facilities for crude oil, gas (natural and manufactured), and finished petroleum products; above or underground pipelines designed to transport petroleum or natural gas; and marine terminals and cargo handling facilities. In addition, CAFRA requires that a permit be obtained for construction of a variety of facilities which may be spurred as a result of proposed oil and gas development offshore New Jersey.[1]

The CAFRA Permit Section of the Office of Coastal Zone Management, Division of Marine Services within DEP leads the multi-agency review process on CAFRA permit applications. The major CAFRA energy facility application to date concerned the Hope Creek nuclear plants conditionally approved on October 20, 1975.[2]

Some state-level land use jurisdiction over energy facilities along the coast is also provided indirectly by the New Jersey Wetlands Act and Riparian Statutes.[3] Any energy development which entails the destruction of the State's designated coastal wetlands requires a Wetlands permit. State riparian jurisdiction extends to those lands now or formerly flowed by mean high tide. No riparian grant, license, or permit may be issued for any proposed use of the state-owned tidelands sea bed which is not consistent with the "public interest". Standards for the exclusion of certain types of facilities from parts of the coast or criteria for the protection of certain lands and waters could be enforced by one or a combination of these laws.

Under the Act reorganizing the Department of Environmental Protection, the Department is charged with the regulation of facilities which handle hazardous substances or emit harmful emissions.[4] This in effect empowers the Department to regulate pollution emitted from refineries and gas processing plants outside the jurisdiction of the CAFRA, Wetlands and Riparian Acts.

2. State Agencies

Numerous other agencies of state government in New Jersey consider energy matters today.

(a) Department of Energy

On July 11, 1977 the Department of Energy (DOE) was established (PL 1977, Ch. 146). It has been charged during the first year of its formation to draw up a ten year master plan for the production, distribution, consumption and conservation of energy in the state. DOE has absorbed the Department of Public Utilities, now the Board of Public Utilities and the former State Energy Office. Section 13(c) gives the Department coextensive jurisdiction with other state agencies regarding the siting of energy facilities. At the same time, no state agency such as the Office of Coastal Zone Management may grant or deny a permit relating to the construction or location of an energy facility without due consultation with the DOE. The statute provides for an Energy Facility Review Board concerning the disposition of energy applications in the event of disagreements among agencies.

(b) Department of the Public Advocate

The Division of Rate Counsel in the Department of the Public Advocate was established in 1974 to represent the public interest before the Public Utility Commission whenever public utilities seek rate increases.[7] The function of the Rate Counsel is to ensure that increases being sought are justified and fair. Consequently, every time a utility in the state has sought a rise in the price of electricity or gas, the Rate Counsel has become involved.

The Public Advocate's public interest mandate involves it in environmental protection issues. Indeed, the Public Advocate has become involved in many of the energy issues referred to in this working paper. It has challenged decisions by NJDEP and the Nuclear Regulatory Commission on the Hope Creek nuclear facility and the Offshore Atlantic Generating Station. Though not directly a party to the proceedings, the Public Advocate has filed briefs on behalf of the three New Jersey counties who are involved in litigation on the U.S. Department of Interior's Environmental Impact Statement concerning OCS Lease Sale No. 40.

The Public Advocate has also opposed the siting of LNG facilities in New Jersey and joined the Attorney General of New Jersey and the States of Delaware, New York and Pennsylvania in their petition to the FPC for siting guidelines on LNG facilities.

(c) Other Agencies

Though not specifically concerned with siting decisions, other departments are involved with energy matters. The Department of Community Affairs administers the energy subcode of the Uniform Construction Code. (Note that the new Department of Energy statute requires DOE to review functions performed by other state agencies relating to energy and recommend to the legislature those programs which should appropriately be transferred to DOE. It is possible that the administration of the energy subcode of the Uniform Construction Act will be transferred to DOE.) The Department of Labor and Industry, Division of Planning and Research publishes energy statistics in its monthly New Jersey Indicators and analyzes

selected energy issues from time to time. In addition, there is the Governor's Cabinet Energy Committee, consisting of the Commissioners of the various state Departments which steered the state through the gas crisis in January and February of 1977 before the creation of the Department of Energy.

3. Federal Role

The Federal government's involvement in regulating energy, particularly pricing, the stockpiling of emergency supplies and their allocation in time of need is considerable. The importance of energy to the health of the national economy resulted in the creation of a Federal Department of Energy on October 1, 1977. In the interest of improved efficiency, the agency has absorbed several agencies such as the Federal Energy Administration and Federal Power Commission as well as certain functions carried out by existing Departments. The new Department will, for example, administer the naval oil and shale reserves formerly administered by the Department of Defense; establish values to be used in leasing outer continental shelf lands, a function formerly performed by the Bureau of Land Management; and set conservation standards in buildings previously set by the Department of Housing and Urban Development. With respect to nuclear matters, the Energy Research and Development Administration has been transferred to the new Department, while the Nuclear Regulatory Commission will continue to function as an independent agency. New Jersey expects to work closely with the new Department as it becomes organized and develops its identity.

This section discusses the national interest which federal agencies attach to energy facility siting, as well as the matter of federal preemption and federal consistency.

(a) The Federal Interest in Energy Facility Siting

In order to merit approval of the State's program under the federal Coastal Zone Management Act, New Jersey must address energy facility siting in its management program. Before the Department of Commerce can approve the program, the Secretary must find:

> ...adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature.[8]

The 1976 Amendments to the Coastal Zone Management Act have made explicit the presumption that energy development involves the national interest. Each state's coastal management program is now required to include:

> a planning process for energy facilities likely to be located in, or which may significantly affect, the coastal zone, including but not limited to, the process for anticipating and managing the impacts from such facilities.[9]

The national interest clause as it relates to energy development is clearly relevant to New Jersey. The chief rationale advanced by the Department of the Interior for the accelerated OCS leasing program, of which Lease Sale #40 is one element, is that it would help reduce the nation's dependence on foreign oil. It might well be argued that a State policy opposing the construction of certain OCS-related facilities along the Jersey coast would be contrary to the "national interest" and therefore would constitute grounds for the disapproval of the State's coastal program.

It remains unclear to what degree the "national interest" will influence energy facility siting policies in New Jersey. Certainly a state such as Delaware, which has banned heavy industry categorically from its coastal area, might have to give a stronger accounting for its action than New Jersey, whose coastal law requires balancing of economic and environmental interests. Prior to the passage of the 1976 Amendments, Robert Knecht, Assistant Administrator in the U.S. Office of Coastal Zone Management, stated that a management program would not necessarily fail to be approved "...because it excludes such facilities as refineries or power plants from the coastal zone".[10]

(b) Federal Consistency

The "federal consistency provision" of the Coastal Zone Management Act encourages the federal government to cooperate with states in managing energy facility development. After a state's management program has been approved by the Secretary of Commerce, any applicant for a federal "license or permit to conduct an activity affecting land and water uses in the coastal zone of that state" must certify that the proposed activity is consistent with the approved management program. No license or permit may be granted by the federal agency involved until the state has concurred in the certification, unless the Secretary of Commerce determines that the activity is consistent with the objectives of the Act or is otherwise required in the interest of "national security".[11]

The 1976 Amendments to the Coastal Zone Management Act specifically extend the range of activities covered under federal consistency to OCS development. Any plan for the exploration and production of OCS resources must be accompanied by a certification that each activity described in the plans is consistent with any federally-approved state coastal management program.

In conjunction with the requirement that the national interest involved in the siting of energy facilities be reflected in the state's management program, the federal consistency clause provides one important base for a state energy facility siting policy. The national interest provision requires that the need for new energy development, both on a national and state-level basis, be considered early in the course of program development. The consistency provision helps the state to subsequently insure that energy facility construction will, in fact, conform to the state's coastal management strategy.[12]

3. Federal Preemption

Federal preemption is an issue common to the production of nuclear power, the development of Outer Continental Shelf resources and the distribution of liquefied natural gas. There appears to be varying degrees to which federal agencies will pursue their federal preemption prerogatives. The U.S. Atomic Energy Commission, for example, deferred to New Jersey on a siting issue when it refrained from acting on the Newbold Island site for a nuclear reactor. On the other hand, a federal court reviewing a Federal Power Commission approval to build a LNG storage facility i the Hackensack Meadowlands was adamant in upholding the FPC's prerogative over a state agency which had denied the building permit.[13]

Footnotes

[1]Coastal Area Facility Review Act, N.J.S.A. 13:19-1 et seq.

[2]Hope Creek Opinion #20, October 20, 1975.

The proposed Forked River nuclear plant was exempted by a Hearing Officer from the CAFRA permit process on the grounds that building had begun before the enactment of the CAFRA statute in 1973.

[3]Wetlands Act N.J.S.A. 13:9A et seq. and Riparian Statutes, N.J.S.A. Titles 12 and 13.

[4]Department of Environmental Protection Act, N.J.S.A. 13:1D et seq.

[5]Oil Spill Compensation and Control Act, Chapter 141, L. 1976.

[6]Public Utility Commission Act N.J.S.A. 48:2-1 et seq.

[7]The Public Rate Counsel was established by N.J.S.A. 52:17E-15 "Public Interest" is defined as "...public interest shall mean an interest or right arising from the Constitution, decisions of court, common law or other laws of the United States or of this State inhering in the citizens of this state or in a broad class of such citizens". (N.J.S.A. 52:17E-30)

[8]Coastal Zone Management Act of 1972, P.L. 92-583, Section 306(c).

[9]Coastal Zone Management Act Amendments of 1976 P.L. 94-370.

[10]Quoted in Rubin, Kenneth A., "The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf", Natural Resources Lawyer, Vol. 8, No. 3.

[11]Coastal Zone Management Act, P.L. 94-370, Sec. 307(d).

[12]For a discussion on federal consistency, see, Topper, Andrea Grappling with Intergovernmental Relations: Federal Consistency and the Coastal Zone Management Act of 1972, As Amended. Master's Thesis submitted to the Graduate School of Public and International Affairs, University of Pittsburgh, April 1977.

[13]Transcontinental Gas Pipeline Corporation vs. Hackensack Meadowlands Development Commission, 464 F2d 1358.

The court hinted that it might have acted differently if the state agency had guidelines or standards in effect at the time of the denial based on planning and safety considerations.

VI. REGIONAL ANALYSIS

This section briefly indicates the location of existing energy facilities for six regions of the coast, and analyzes the ability of these regions to absorb additional energy facility development.

A. Hudson River Waterfront, Newark and Raritan Bay

The coast in this region of the state is outside the present CAFRA boundary. It is the site of many energy facilities, as well as other forms of industrial and commercial development. It includes the Port of New York and New Jersey, administered by the New York-New Jersey Port Authority of New York and New Jersey, and the Hackensack Meadowlands, which are governed by the Hackensack Meadowlands Development Commission.

New Jersey's portion of the Port of New York and New Jersey is one of the most intensely developed areas in the country. Within Bergen, Hudson, Union and Middlesex counties are located seven electric generating plants, two oil refineries (one of which is currently not operating), and numerous oil and gas pipelines and their storage areas. Included among the numerous port facilities in the region are marine terminals that receive crude oil, refined petroleum products and a wide variety of petrochemicals.

The use of this region for energy-related purposes is facilitated by its accessibility for ocean transport. The channel in New York harbor is maintained at a depth of forty feet.

The presence of an energy infrastructure and the proximity of the area to high energy demand centers suggest that this region will continue to be an important location for energy facility development. In fact, the Port Authority of New York and New Jersey is currently investigating the suitability of sites in the Port as a staging area for OCS exploration. Finally, although no LNG facilities exist in New Jersey, PSE&G has such facilities on Staten Island, directly across from the Arthur Kill from New Jersey.

The State regulates energy facilities in this region indirectly through the processing of air and water permits and the issuance of riparian grants, leases, and permits. A proposal to build chemical storage tanks in Bayonne-Jersey City, for example, came to the attention of the Department of Environmental Protection (DEP) by virtue of permits the company needed to comply with state and federal air and water standards and riparian permits which it needed to build to the pierhead line.

Because the region is already so intensively developed, refinery expansion or the construction of a gas processing plant, for example, could be viewed as having relatively small incremental impacts on the environmental quality or aesthetic character of the region. Residents in the area, however, see development pressures from two perspectives. On the one hand, they welcome the jobs which energy development would bring. They also feel that they have contributed their fair share in providing the state and the region with energy facilities which have degraded the quality of their air, water and aesthetic environment.

B. North Shore

Middlesex and Monmouth counties constitute the northern boundaries of CAFRA. Middlesex abuts Raritan Bay and has, in contrast to Monmouth, a high concentration of energy facilities. The "Jersey Shore" begins with Monmouth County and its orientation to the ocean.

Middlesex County contains four electric generating stations and one petroleum refinery. The Raritan River has a channel depth of 30 feet, and accommodates small tankers travelling to the various energy facilities fronting on the Arthur Kill Waterway.

In the event that oil and gas is commercially produced in the Baltimore Canyon, these counties may be affected. Efforts may be made to route offshore pipelines north of Sandy Hook to existing refineries in Linden and Perth Amboy. While this strategy would protect ocean beaches and leave the barrier islands undisturbed, the offshore waters could pose several hazards to pipeline placement by virtue of an explosive dumping area and existing shipping lanes off Sandy Hook. Because of the heavy shipping in this area, it will be necessary to assure that pipelines, if used, be deeply imbedded in the ocean floor so that ship anchors do not pose unnecessary risks.

While Monmouth County might not feel the pressures to the degree of Middlesex, it could be impacted by spills in the event that tankers were used because of the increased statistical risk of oil spills associated with tankers. In this case, tourism in the area might suffer.

In 1972, Jersey Central Power and Light Company proposed to site an oil-fueled generating plant in Union Beach, on Raritan Bay. The application, which falls under the Wetlands Act and other authorities, is presently dormant.

C. Central Shore

Ocean County's main coastline is protected by two barrier beach islands separated by Barnegat Inlet, which has an average channel depth of ten feet. It includes Long Beach Island and Island Beach State Park. Because of the great recreational and ecological significance of this section of the Atlantic coast, Ocean County would be among those areas of the State most susceptible to the adverse affects of energy facility development.

Nonetheless, Ocean County is the site of two electric power plants, including the Oyster Creek nuclear station in Lacey Township. Rated at 650 MW, the Oyster Creek station was the first commercial reactor in the nation when it began operating in 1969. Jersey Central Power and Light has started to build a second nuclear plant, known as Forked River, immediately adjacent to Oyster Creek, in Lacey Township.

Ocean County's proximity to the Baltimore Canyon makes it a potential site for hydrocarbon pipelines, gas processing facilities and other OCS-related facilities. The shallow channel depths of the Barnegat inlet would seem to preclude Ocean County, however, as a staging area. The great importance of recreation in this County raises major concerns over potential conflicts with OCS activities.

A moratorium on the issuance of CAFRA residential permits within four miles of the Oyster Creek plant was imposed in March 1976 by the Department of Environmental Protection pending a study to determine appropriate land uses surrounding nuclear plants.

The Board of Chosen Freeholders of Ocean County has officially opposed proposals for further nuclear power plant construction within its jurisdiction.

D. South Shore

Like Ocean County, the South Shore of Cape May, Atlantic, and Burlington counties is devoted to low intensity land uses, such as recreation, with which energy development may conflict. Atlantic City, however, has special potential as a location for OCS-related energy facility development, because of an established infrastructure, manpower, and available land.

Four electric generating stations are located on the South Shore. Although no nuclear stations presently exist in the region, the Public Service Electric and Gas Company has submitted a proposal to construct a floating nuclear plant 2.8 miles off of Little Egg Harbor. The twin reactors would be placed on barges and surrounded by a massive breakwater. A proposal to construct a floating nuclear plant 2.8 miles off Atlantic City is under review by the U.S. Nuclear Regulatory Commission. The earliest possible date for the start of operations is the mid-1980's. Special state legislation would be needed by the utility to use State waters beyond the pierhead line. A CAFRA permit is also required.

A moratorium on the issuance of CAFRA residential permits within four miles of the Oyster Creek plant was imposed in March 1976 by the Department of Environmental Protection pending a study to determine appropriate land uses surrounding nuclear plants. Both Atlantic and Cape May Counties have adopted resolutions opposing both floating and land based nuclear plants within their jurisdictions.

The Atlantic City area has been viewed as a potential staging area for OCS activities. The Absecon Inlet has a channel depth of between 15 and 20 feet suitable for some OCS support vessels. The channel is, however, subject to frequent shoaling. Although most oil and gas companies which obtained leases in Sale 40 will be using Davisville, Rhode Island as their support base during exploration, one company at least, has expressed an interest in using Atlantic City as its operating base.

In 1975, stratigraphic well drilling by a consortium of oil and gas companies under the supervision of U.S. Geological Survey was conducted out of Atlantic City. Although interest in onshore OCS-related development by local government in Atlantic City has lapsed somewhat since the passage of the referendum approving casino gambling, the area's proximity to the offshore tracts makes it a natural candidate for some onshore OCS activities. Lessees, for example, have identified Atlantic City in their exploration plans as their helicopter base to carry personnel back and forth to the rigs. Also, the U.S. Geological Survey, which oversees OCS operations, opened an office in the City in April 1977. In addition, the Atlantic City area, which is closest to some of the offshore lease tracts, is a possible site for a potential pipeline since economics will favor the shortest, most direct route to land offshore oil and gas. If Atlantic City area were to serve as a landfall, a pipeline might be routed westwards along the existing right-of-way of the Atlantic City Expressway to the Delaware River area refineries or northwards to the Linden and Perth Amboy refineries.

Some indication of the role perceived by Atlantic City for OCS activities will probably be indicated in the Master Plan that is currently being prepared by the Office of Angelos Demetriou of Washington, D.C.

E. Delaware Bay

Cumberland and Salem Counties have been the focus of energy proposals for two reasons: large land areas are available for development in both counties; and the low population means that a smaller number of human lives are at risk from nuclear or other types of energy-related accidents, than would be the case elsewhere in the State.

The two counties are the site of three fossil-fueled and four nuclear fueled electric generating stations. (See Figure 3, p. 13). The first of the nuclear units, known as Salem #1, began operations in December 1976. The Hope Creek nuclear generating units are expected to commence operations in 1982 and 1984. The Hope Creek units were approved in 1975 under the Coastal Area Facility Review Act.

Artificial Island, which will ultimately accommodate all four nuclear units was formed from dredge spoils from the Delaware River. It has been deemed a suitable site for energy development because of its distance from population centers and the availability of cooling waters. Further energy development at this location, however, would place an increased thermal load on the environment.

F. Delaware River Waterfront

Like the Hudson River Waterfront, the Delaware River Waterfront, including Gloucester, Camden, Burlington and Mercer counties, is also a center of energy facilities in New Jersey.

The Delaware River Waterfront, including both New Jersey and Pennsylvania, is the site of numerous energy facilities. The facilities in New Jersey include two refineries and four electric generating stations. In addition, numerous transcontinental hydrocarbon pipelines either terminate in this region or traverse the region en route to facilities in New Jersey along the Hudson.

This region is also the proposed location of two LNG facilities. The El Paso Eastern Company has applied to both the Federal Power Commission and New Jersey Department of Environmental Protection to build an LNG port terminal facility in Logan Township, Gloucester County. Tenneco LNG, Inc. has proposed a facility for West Deptford, also in Gloucester County. An environmental impact statement by staff to the Federal Power Commission on the LNG projects recommended that the Tenneco application be denied on the basis of safety hazards. The State has petitioned the FPC to issue LNG facility siting guidelines, prior to action on these applications. At the moment, both of these proposals are dormant.

The City of Camden has been identified as a possible site for some OCS activities, particularly the construction of a platform building yard. It is likely that Camden will be impacted by secondary and induced effects of OCS as a result of its proximity to the Mobil and Texaco refineries and its existing industrial base and infrastructure. Again as with Atlantic City, it is expected that this would have a rejuvenating influence on the City's economy. As in the case of the Hudson River waterfront, the relatively small incremental impact on the environmental quality or aesthetic character of the region produced by energy facility development must be balanced against the need to equitably distribute the effects of development, positive as well as negative.

VII. ENERGY FACILITY SITING POLICIES

NJOCZM's involvement in energy planning and siting stems from the suitability that a coastal or waterfront site affords an energy facility in terms of access for transportation and cooling. Also, NJOCZM has a mandate to include energy facilities in its coastal zone management program. In developing the energy element of this coastal plan, NJOCZM has been hampered by the lack of state-specific data on energy supply, demand and projections. Hopefully, this situation will change as the new Department of Energy starts work on the Master Plan it is charged to prepare during its first year of operation. This should simplify the data gathering and analysis NJOCZM has been performing and permit more time to concentrate on developing more specific energy facility siting policies.

The energy facility siting policies reproduced below are those which appear in A Coastal Management Strategy for New Jersey -- CAFRA Area,[1] a document required by the 1973 Coastal Area Facility Review Act (NJSA 13:19-16). They were based on consultations with staff of DEP, the new Department of Energy and on responses received by utilities, energy companies and individuals to the Interim Land Use and Density Guidelines for the Coastal Area of New Jersey[2] and the Call for Information on Coastal Area Energy Facility Siting[3] issued in 1975 and 1976. They were also based on research conducted in preparing earlier drafts of this report. Clearly, these policies are but one step in the complex task of establishing comprehensive energy programs and planning. In succeeding publications, NJOCZM will work to refine these policies and to spell out their implications for specific coastal regions and sites.

These policies indicate general criteria NJOCZM will use to evaluate a specific coastal energy facility proposal. They provide an opportunity for interested individuals and groups to comment on the direction indicated by the policies and their compatibility with draft policies for other coastal uses, and to suggest beneficial next steps in coastal energy policy making. Lastly, these policies offer a position to be compared and coordinated with positions taken by the many other agencies at all levels of government with responsibility for coastal and/or energy decision making.

GENERAL ENERGY FACILITY SITING POLICY

1. Energy Facilities will be approved only after review by DEP and the New Jersey Department of Energy (P.L. 1977, C. 146, N.J.S.A. 52:27-1 et seq.) to insure the protection of both the built and natural environment of the coast and of public health, safety and welfare, to the maximum extent feasible. Energy facilities must demonstrate consistency with the master plan to be prepared by the Department of Energy for the production, distribution, consumption and conservation of energy. The overlapping responsibilities of the Department of Environmental Protection and the Depart-

ment of Energy require early consultation between these two agencies to promote efficiency and the orderly siting in the coastal zone of clearly needed energy facilities.

Where the Department of Energy and the Department of Environmental Protection do not agree on a specific energy facility application (for example, concerning the need for a particular energy facility in the coastal zone, or for a specific proposed site for one type of energy facility), the disputed decision shall, in accord with state law, be submitted to the State's Energy Facility Review Board for final administrative action.

GENERAL OUTER CONTINENTAL SHELF (OCS) OIL AND GAS EXPLORATION AND DEVELOPMENT POLICY

2. Rapid exploration of the Mid-Atlantic, North Atlantic, and other offshore areas with potential reserves of crude oil and natural gas is encouraged, as long as all activities related to these potential offshore energy resources are carried out in a manner that respects the built and natural environment of the coastal zone.

The decision of the U.S. Department of Interior to lease offshore tracts for crude oil and natural gas exploration presents New Jersey with new onshore and marine-related environmental problems and opportunities. New Jersey supports offshore exploration, recognizing the national need to identify new energy supplies, as long as this new industrial activity does not conflict with the State's second most important industry, tourism, which depends upon the high quality and public perceptions of the coastal environment.

ONSHORE SUPPORT BASES

3. Onshore support bases to support offshore oil and gas exploration, development, and production (including facilities for work boats, crew boats, pipeline barges, and storage facilities) shall be encouraged to locate in built-up urban areas of the coast that have land already committed to heavy or light industrial uses and adequate harbor facilities. Preferable locations for onshore support bases include urban waterfront areas where onshore physical, economic, social, and institutional impacts will be less than the impacts likely to take place in those less industrially developed areas which are more dependent upon tourism and the resort industry.

With offshore exploratory activity expected to begin off New Jersey in the Baltimore Canyon in early 1978, the offshore oil and gas industry is likely to seek onshore support bases closer to the offshore tracts than the prsent temporary bases established by the major oil, gas, and offshore service and supply companies at Davisville, Rhode Island. This policy recognizes that the New Jersey coast is favored by proximity to the offshore tracts as a site for onshore staging bases, and carries out the basic policy to concentrate rather than disperse industrial development in the coastal zone.

OFFSHORE PLATFORM CONSTRUCTION YARDS

4. Platform construction yards will be encouraged in built-up areas which have the requisite acreage, adequate industrial infrastructure, ready access to the open sea, adequate water depth, and where the operation of such a yard would not alter existing recreational uses of the ocean and waterways in the area.

If offshore exploration proves successful, then the development phase of OCS activity in the Mid-Atlantic may require a site or sites for constructing the steel platforms used offshore, in addition to the platform construction yard tentatively planned for the vicinity of St. Charles on the Chesapeake Bay on the Delmarva Peninsula in Virginia. Platform yards typically do not have the adverse air and water quality impacts associated with some other industries. Platform construction yards are labor intensive and could exert potentially disruptive effects on the economy and social structure of undeveloped areas. For these reasons, offshore platform construction yards are encouraged to seek locations in the already developed areas of the New Jersey coast.

PIPELINES AND ASSOCIATED FACILITIES

5. Crude oil and natural gas pipelines will be permitted to bring hydrocarbons from offshore New Jersey's coast to existing refineries and oil and gas transmission and distribution systems, subject to the following conditions:

   (a) The number of pipeline corridors, including trunk pipelines for natural gas and oil, shall be limited, to the maximum extent feasible, and designated following appropriate study and analysis by Department of Environmental Protection and the New Jersey federal, state and local agencies and affected industries,

   (b) The initial corridor shall, to the maximum extent feasible, be located along existing rights-of-way and shall avoid undeveloped regions of the Pine Barrens; specifically, the corridor shall avoid the Mullica River and Cedar Creek watersheds and portions of the Rancocas Creek and Toms River watersheds (the 760 square mile region identified by DEP as a proposed "critical area" for sewerage purposes and proposed non-degradation water quality standards) and other undeveloped parts of the Pine Barrens, and instead follow already existing developed or disturbed rights-of-way such as the Atlantic City Expressway,

   (c) Major pumping stations and other ancillary facilities to the oil and gas pipelines shall be encouraged at locations outside of the coastal area designated by CAFRA and two miles inland of the ten foot contour interval elsewhere in the state,

(d) Proposals to construct oil and gas pipelines through all or part of the coastal zone shall be evaluated by DEP and the Department of Energy, in terms of the entire new potential pipeline corridor through the State of New Jersey, including all of the contemplated ancillary facilities, including but not limited to gas processing plants, oil storage terminals, booster stations, and other related facilities. These ancillary facilities shall preferably be located well inland from coastal waters and protected by adequate visual, sound, and vegetative buffer areas. The ancillary facilities along the pipeline shall also be located outside of the coastal zone to the maximum extent feasible.

(e) A pipeline corridor through the state coastal waters, as well as through the territorial sea of the United States, shall, to the maximum extent feasible, avoid dumps, heavily used waterways, geological faults, and especially productive vegetation, fish or shellfish habitats. The pipeline corriddor shall be trenched to a depth sufficient to withstand exposure by scouring.

New Jersey recognizes that pipelines, rather than other modes of transportation such as tankers and barges, are the most environmentally sound method of bringing ashore crude oil and natural gas from offshore wells. At the same time, the potential onshore effects of pipelines on the sensitive ecosystem, of the coast and the Pine Barrens, and the visual, noise, and odor impacts potentially associated with the ancillary facilities require that New Jersey proceed cautiously and prudently in selecting pipeline corridors, specific alignments, and locations for ancillary facilities.

OIL REFINERIES AND PETROCHEMICAL FACILITIES

6. New oil refineries and petrochemical facilities are discouraged in the CAFRA region of the coastal zone, and prohibited on barrier islands. Expansion or modernization of existing oil refineries and petrochemical facilities at existing sites will be encouraged if such expansion does not violate applicable state and federal air and water quality standards.

Oil refineries and petrochemical facilities will not be permitted in areas where they might conflict with the resort-tourism industry or areas of recreational or biological value.

CRUDE OIL STORAGE

7. Crude oil storage facilities will not be permitted on barrier islands. Storage facilities for crude oil, in the absence of refining facilities, will be permitted only in established ports and harbors and where new or expanded oil storage facilities will not contribute unacceptably to overall regional air or water quality degradation.

Crude oil storage facilities are not coastal-dependent and will not be permitted where they might limit recreational or open space uses of the coast.

TANKER TERMINALS

8. Multi-company use of existing and new tanker terminals will be encouraged to the maximum extent practicable consistent with anti-trust laws. New or expanded tanker facilities will be discouraged only if they would increase tanker operations and increase associated onshore development in a manner incompatible with the character of non-industrial parts of the coastal zone.

Onshore tanker facilities pose potential environmental impacts Tanker terminals encourage secondary development activity that need not necessarily be situated near the coast. New tanker facilities will be encouraged in existing ports and harbors.

DEEPWATER PORTS

9. If a deepwater port were proposed, at the very least, its pipeline routing would be required to follow the pipeline policies above; more broadly, the entire proposal would be carefully evaluated in terms of the potential positive and negative roles a deepwater port could play in protecting or harming the broad range of coastal resources.

Offshore tanker terminals, sometimes called deepwater ports, have the potential for reducing spills associated with tanker movements in coastal waters. Also, deepwater ports offer potential economies of scale as they may accommodate supertankers that are too big to enter New Jersey's ports. At present, while two deepwater ports are under active consideration along the Gulf Coast, no proposals for deepwater ports appear likely in the near future in New Jersey.

BASE LOAD ELECTRIC GENERATING STATIONS

10. New or expanded fossil fueled electric generating stations powered by coal and oil will be discouraged in "Preservation" and other environmentally sensitive areas, and will be directed toward relatively built-up areas, consistent with applicable air and water quality standards.

11. No further nuclear electric generating stations will be approved in the coastal zone unless: (a) the Department of Environmental Protection and the New Jersey Department of Energy are satisfied of the safety and risk potential of this energy technology, including any differences between offshore and land-based plants, (b) the two agencies are assured that operation and disposal of the spent fuel poses no unacceptable safety or environmental hazards to New Jersey residents, (c) the two agencies receive clear proof through the Depart-

ment of Energy's Master Plan that nuclear facilities are needed and vitally important to the public health welfare, and economic well-being of New Jersey residents, (d) the Department of Environmental Protection is assured that the location of the facility will not result in near-by population density increases over the operating lifetime of the facility which might make impossible suitable protective actions in the case of a serious accident, and (e) the Department of Environmental Protection and the Department of Energy are satisfied that no other feasible and economical energy alternative exists for the timely and efficient production of needed electrical power.

New Jersey's CAFRA region has two operating nuclear generating stations: Oyster Creek in Ocean County and Salem Unit 1 at Artificial Island in Salem County. Four nuclear plants are under construction: Salem Unit 2, Forked River in Ocean County, and Hope Creek Units 1 and 2, on Artificial Island in Salem County (the Hope Creek units received CAFRA permits in 1975). A floating nuclear plant, the Atlantic Generating Station Units 1 and 2, is proposed by Public Service Electric and Gas Company for site 2.8 miles off Little Egg Harbor Bay, about 12 miles from Atlantic City.

LIQUIFIED NATURAL GAS (LNG)

12. Until the risks inherent in LNG terminal operations are sufficiently identified and overcome, and until such terminals are found to be consistent with the public health safety, and welfare of nearby residents, LNG terminals shall be built only at sites remote from substantial concentrations of human populations. No LNG terminal shall be approved in the coastal zone until the Federal Power Commission (FPC) responds affirmatively to the petition by New Jersey and its neighboring states for the issuance of siting criteria that adequately consider the safety hazards associated with this energy technology. If the FPC does not respond positively to the petition by New Jersey and others, then New Jersey should attempt to create an interstate task force to define appropriate siting criteria for this type of energy facility, whose impacts could clearly affect several states.

LNG facilities have been proposed in recent years for Deptford and Logan Townships in Gloucester County, New Jersey, and on Staten Island, New York from where the LNG would be pipelined to New Jersey. Because tankering, transfer and storage of LNG pose significant risks to safety and health and the environment (which may not necessarily be restricted to one state) New Jersey recommends that the siting of LNG facilities be treated on a regional basis.

SOLAR AND WIND POWERED GENERATING PLANTS

13. Solar and wind powered generating plants, including experimental and demonstration projectss, will be encouraged to locate in the coastal zone to the extent that these plants do not unreasonably affect scenic or recreational values and meet existing state and federal environmental requirements.

New energy technologies, such as solar and wind powered plants, should be encouraged as the Nation seeks imaginative responses to the energy challenge.

Planning for Energy Facilities

DEP/OCZM will continue to sponsor studies at both the state and county level to provide maximum information regarding the need for energy facilities, the impacts of different types of facilities and the ability and willingness of specific coastal locations to accommodate specific energy facilities. Where appropriate, these studies will be carried out in cooperation with other public agencies at the local, state and/or federal level.

VIII. CONCLUSION

The complex problems and questions raised by energy issues are new to most New Jersey residents. Hindering the process is the rapidity with which new and often conflicting information on energy matters is being issued necessitating constant review, analysis and updating. Indeed, constantly changing decisions by the state and federal government, which in turn reflect reordered priorities on energy matters, have already resulted in several revisions of this draft, and it is highly likely that between the completion and printing of this report, events will occur which will supersede some of the statements made here.

Decisions on energy policy can dramatically affect each individual's life. They can no longer be considered "too technical" to allow for the concerns and comments by members of the general public. This paper is an attempt by the New Jersey Office of Coastal Zone Management to provide the public with information on energy facility siting in the state and to propose initial siting policies.

In asking for comments on this paper, the Office of Coastal Zone Management seeks criticisms of the suggested policies. It also seeks corrections, comments and suggestions on the factual materials presented. Policies to best meet New Jersey's energy needs will emerge only from a decision-making process which provides the information and opportunity for participation by a wide range of people.

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